AMERICAN MACHINIST

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Forty-Eight Inch Car-Wheel Boring Machine.

We illustrate on this page a 48-inch car-wheel boring machine, made by William B. Bement & Son, Philadelphia.

The frame has the general outline used for many years by this firm for machines of this class, and is unusually strong.

The bearing of the revolving table is made in the form of the Schiele curve; two such parts of one continuous curve being combined as will give the required vertical and lateral support, and at the same time maintain their unformity of bearing.

The three chuck jaws are concentrically tightened upon the wheel by a single movement of a lever, and are quickly adjustable to wheels of any diameter not exceeding 43 inches on the tread.

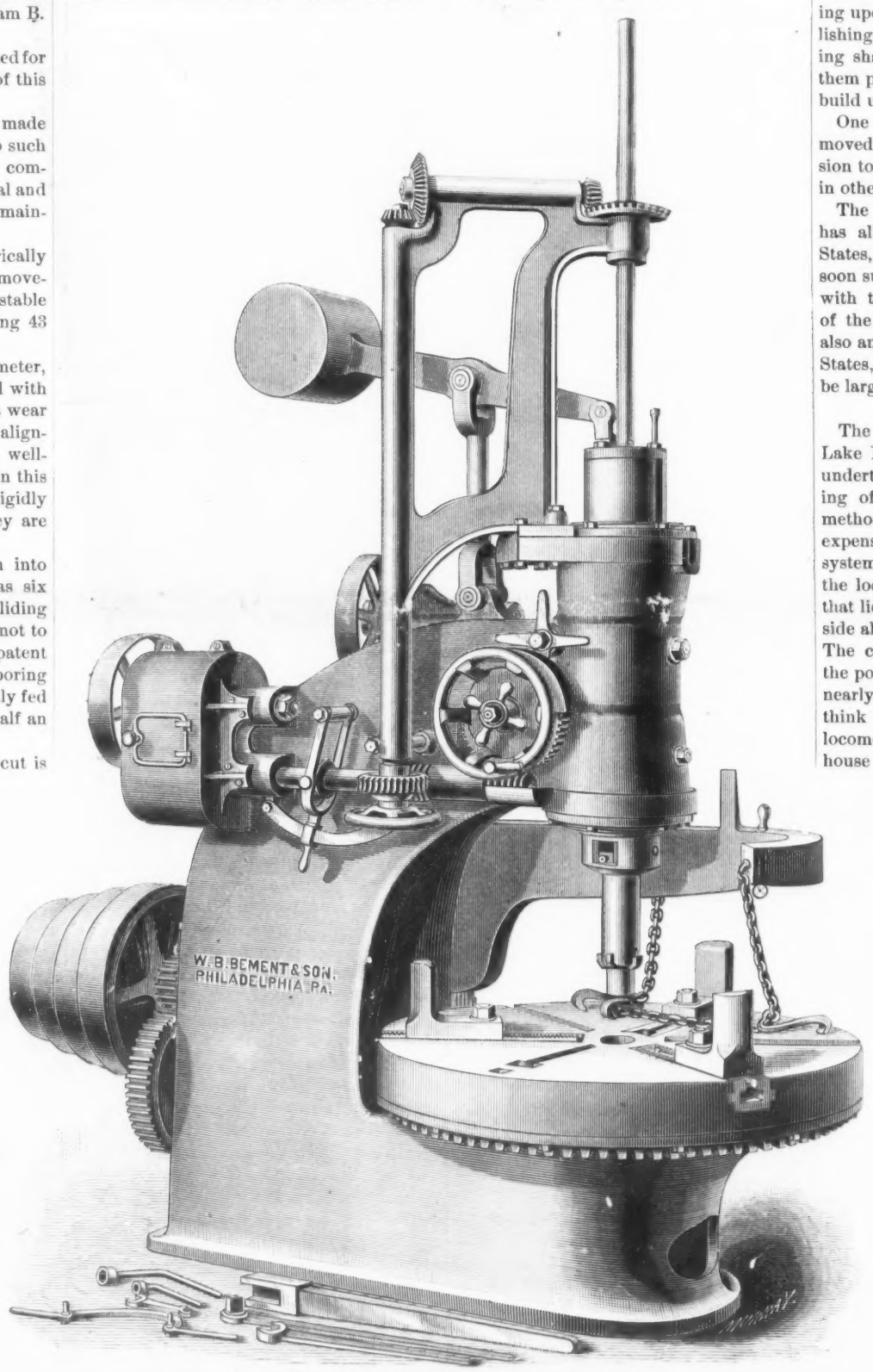
The boring spindle is of large diameter, hollow, counterbalanced, and provided with quick and easy hand movement. Its wear is compensated for, and its accurate alignment preserved, by the use of the well-known split conical bushings, which in this case have large surfaces and can be rigidly clamped in any position to which they are adjusted.

The vertical boring feed is thrown into gear by a conical friction, and has six changes which are operated by a sliding clutch-pin; a device so long in use as not to need explanation. L. R. Faught's patent quadruple cutter is much used as a boring tool in these machines, and is frequently fed through a finishing cut at the rate of half an inch per revolution.

The hub-facing device shown in the cut is also one patented by Mr. Faught. A slide which carries the facing tool receives a surfacing feed from a vertical shaft which passes centrally through the boring spindle and may be actuated either by hand or by power. A gauge screw is provided, by means of which the facing cutter can be brought into the same position for any number of wheels successively.

The wheels are raised and lowered by a vertical screw, which is caused to revolve rapidly in either direction by the movement of a lever, and upon which the crane arm is threaded and can be swung to any required position. The wheel is caught by hooks fitting the flange and raised to the proper height. It is then swung inward until the crane arm strikes a stop, when the wheel is centrally over the table, and can be lowered vertically into the chuck, no pushing or sliding being required.

These machines, when managed with a very moderate amount of skill, are capable of producing accurate and uniform work with great rapidity.



FORTY-EIGHT INCH CAR WHEEL BORING MACHINE.

Relics Belonging to a Pioneer American Locomotive.

In the blacksmith shop of New York Central's mechanical headquarters there hangs a pair of wheels that attract but little attention, yet they are interesting and valuable relics of early railroad machinery. They are the wheels of the "De Witt Clinton," the first locomotive owned by what is now the New York Central & Hudson River Railroad, and the first railroad locomotive operated in the State of New York. The "De Witt Clinton" was built by the West Point Foundry Company, New York, in the beginning of 1831, from designs furnished by John B. Jarvis, Chief Engineer of the Mohawk & Hudson Railroad, and made the first experimental trip on the road in July, 1831. The engine had two cylinders 5½x16 inches, which were set behind the fire box on an incline of about 40 degrees. The engine rested on four wheels connected, 4 feet 6 inches diameter. From an inspection of the wheels at West Albany, we found the spokes were wrought iron, fastened in cast iron hubs and an outer ring of wrought iron.

This was not the first locomotive built in America for railroad service, but she was the earliest of which any portion has been preserved. Baldwin's people preserve with great care some parts of the "Old Ironsides," the first locomotive built by Matthias Baldwin, but that engine was not built for a year after the "De Witt Clinton" was in service. Mr. Buchanan, Superintendent of Motive Power of the New York Central Railroad, talks of mounting the wheels on an axle and placing them in a position where they can be readily seen.

Leading newspapers at the South are urging upon the people the necessity of establishing technical schools, in which the training shall be such that young men may leave them prepared to earn a living, and so help build up manufacture.

One of the Southern States has already moved in the matter by sending a commission to examine the working of such schools in other parts of the country.

The fact that pig iron, made in the South, has already found its way into Northern States, indicates that the South will not only soon supply itself with iron, but will compete with those States that have furnished most of the iron used in the country. There is also an abundance of timber in the Southern States, and furniture will undoubtedly soon be largely manufactured there.

The new management of the New York, Lake Erie & Western Railroad, which have undertaken to regenerate the financial standing of the company through the logical method of increasing income and decreasing expenses, have started out by arranging a system of long runs for the train men. All the locomotives belonging to this company that lie over at the New York end stand outside all the time and have done so for years. The company's management have followed the policy of keeping their rolling stock in nearly even temperature. They did not think it was conducive to the health of a locomotive to take it out of a warm round-house on a cold stormy night to go away into the unsheltered country, so they permitted it to stand where the cold searching winds that rake the valley of the Hudson could keep it down to the temperature of fast running in cold weather. There is no indication of the new management changing the policy in this respect, which annually devours an immense pile of expensive coal.

English iron and steel makers thought they saw in the agitation in that country for an increase of the Navy some hopes of improving their business, which is in a very unsatisfactory condition. To this end they are said to have encouraged the agitation by all legitimate means. Now that enormous appropriations have been made for the purpose named, it has been discovered that the officials have been in negotiation with leading French and German steel makers, on the ground that they manufactured a better quality of steel than was made in England.

In working steam engineering up towards the condition of a science, practice has for the past fifty years been constantly correcting the deductions of theory. Unforeseen elements are constantly met with in practice that have neutralized and modified apparent facts. The gain from expansion has been found to have been greatly overestimated, and the results that were reasonably expected from high pressure have not obtained. Patient

practical research, with many failures, must be depended upon to further improve the steam engine.

Power Needed in Operating the Cable Road on Brooklyn Bridge.

BY A. H. MATHESIUS, M. E.

Taking the cable road on the New York and Brooklyn Bridge for an illustration, it will be found that the cars are drawn across with about half the power that would be necessary for any other system.

The Bridge cable road is provided with two 26″×48″ steam engines that are run with a piston speed of about 480 feet per minute, and are fitted with clutch couplings for the purpose of using one or the other as condition requires. The boiler pressure is carried at about 70 lbs., and the initial pressure in the cylinder is 60 lbs. One engine is found to be ample for all the work called upon, and would be more than sufficient, if the work was more evenly distributed. As it is, the variation of power in an interval of one minute is over 200 horse-power. The cable system is best suited for small, single cars, and, if the travel demands, they may be dispatched as often as desired. By such a method the variation of power will not be so great if one or two cars are released from the cable at the same time, or if it happens that there are a few more cars on one side of a summit than on the other. It ought to be a rule, that the steeper the grade, the smaller the cars. If this rule is neglected there is danger that the cars will run away with the machinery. It approaches this condition on the bridge at present, and certainly will do it if the intention of running four cars in a train is carried out. The reason why the system of running trains instead of single cars on the bridge is adopted is, that when there are more than one grip attached to the cable they can be more relied upon, and also that the peculiar construction of the grip in use is not suited to be drawn around the curve on the Brooklyn station. On this account it is necessary to employ locomotives for switching, and as the distance over which this switching is done is several hundred feet, it requires about two minutes for two locomotives to switch the cars from the point where they are unloaded to the other track, where they are attached to the cable. With a suitable grip single cars can be dispatched as fast as they are loaded.

That part of the bridge over which the cars are drawn by cable is about 5,600 feet long. The grade 3¼ per cent. The speed of the cable is a little over 10 miles per hour, which is about 900 feet per minute. The two cars which are connected in a train, weigh 10 and 8 tons respectively, and when loaded the average weight of a train will be about 26 tons. At two minute intervals three trains will constantly be attached to the cable on each track, which makes six trains in the circuit. The total weight of the six trains is about 156 tons; and, if the maximum car axle and rail friction is taken as 1 per cent. it will require a tension on the cable of 3,120 lbs. from this cause alone. The grade upon which the cars rest is 3¼ per cent.; the total weight which is suspended by the cable and rests on the carrying sheaves is about the thirtieth part of 156 tons, or 10 400 lbs. The carrying sheaves are 15 inches in diameter, and their journals 1 inch, consequently the leverage is 1 to 15. If the journal friction is taken as 10 per cent., the power to overcome the journal friction from the weight of 10,400 pounds on the sheaves will be the 150th part, or about 70 pounds. When the trains are dispatched at two minute intervals it locates them 1,800 feet apart; the summit of the bridge being about 2,800 feet from the starting point, every other minute will bring two trains on one side and one train on the other side of the summit. This being the case on both tracks it will throw two unbalanced trains against or in favor of the power; if against the power the tension on the cable of 52 tons on a grade of 3¼ per cent. has to be added to the above resistance, which is 3,466 pounds. The friction of these two unbalanced trains has been added to the above for the reason that it is a constant whether in favor of or against the power. Then 3,466 pounds added to the total friction of 3,190 pounds gives a tension on the cable of 6,656 pounds. To this must be added the journal friction of about 200 pounds on the driving machinery which is caused by this tension independent of moving itself and cable. The total of these resistances is then 6,856 pounds moved with a velocity of 900 feet per minute, which is equal to about 214 horse-power. If the two unbalanced trains are on the side of the summit to favor the power the tension of 3,466 pounds must be subtracted from the 3,190 pounds of frictional resistances, and the difference subtracted from the power to propel the machinery and cable.

Indicator cards which have been taken under the above conditions show that the maximum power exerted by the engines is about 270 horse-power (Fig. 1). It appears then that 56 horse-power are required to drive the machinery and cable which is about 20 per cent. of the total power exerted. The minimum power shown by another indicator card (Fig. 2), is 54 horse-power, or two horse-power less than that necessary to drive machinery and cable. It will be noticed by the above figures that the trains exert a tension of 3,416 lbs. on the cable; while all the resistances caused by friction of the cars outside of the driving machinery was 3,190 lbs., a difference of 276 lbs. equal to about 7 horse-power. By my calculation it would require only a maximum of 265 horse-power, where it indicates 270 horse-power, and a minimum of 49 horse-power, while it indicates 54 horse-power.

I pointed out at the beginning of this article that if four car trains were to be run on the bridge and distributed as they now are, they would run away with the machinery. I think that the conclusion which one draws from the diagram of the indicator card of the minimum power points that way.

The average power to draw the six trains will be the mean of 270 and 54 horse-power, which is 162 horse-power. The coal account in the bridge engine room shows a maximum consumption of about 4,000 lbs. in 8 hours, which is 500 lbs. per hour, and about 3 lbs. per hour for each horse-power. What other system will do this work with this expenditure of power?

Fig. 1-Scale 40

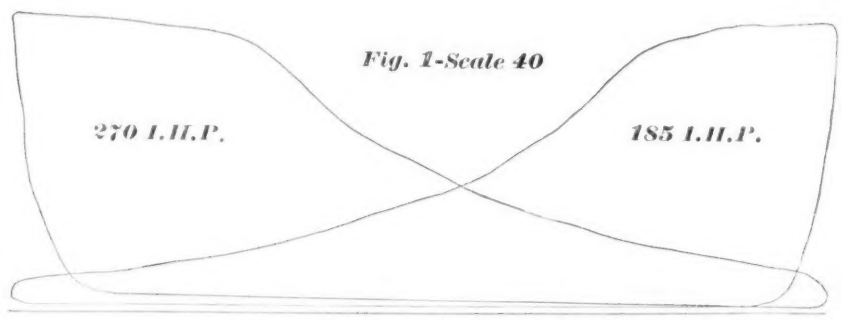
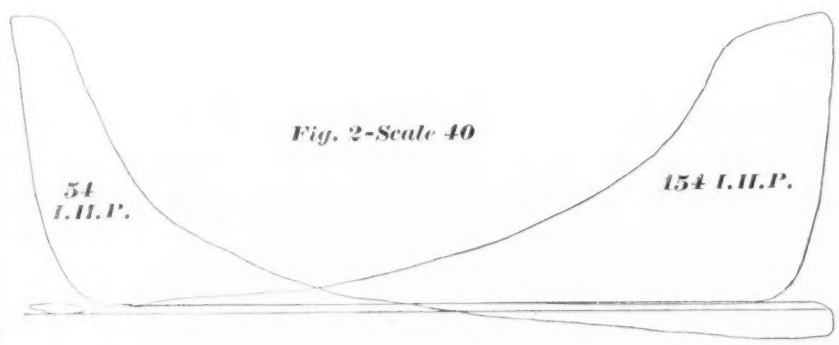


Fig. 2-Scale 40



The inclined plane on the Pennsylvania Railroad, at Pittsburgh, is a gigantic engineering structure of its kind, built according to the most advanced scientific designs, and without regard to cost. Teams, freight, and passenger cars are hauled up by means of steel cables, the plane having a total length of 840 feet, with a rise of nearly forty-three feet to the hundred. It is built on arches, the longest span being 232 feet, another is 120 feet, and the rest are sixty feet each. The cables for hauling the cars are entirely of steel, and the largest ever made in this country. The engines furnishing the motive power are of 700 indicated horse-power.

Early Railways.

In a paper read before a meeting of the Amalgamated Society of Railway Servants of Great Britain, Mr. Clement E. Stretton, C. E., an honorary member traced the growth of British railways from 1630 to 1830. About the former year a Mr. Beaumont took the lead in a movement to facilitate the conveyance of coal from the mines to the points of shipment by means of wooden ways consisting of cross sleepers placed about two feet apart upon which were nailed wooden planks or rails six feet long and about four inches wide. This pioneer of progress also introduced four wheel wagons to run on the wooden ways instead of the ordinary two wheel carts. Like most men, however, who attempted to make innovations on British methods, Beaumont lost his fortune in the attempt, and emerged from his reforming schemes reduced to poverty. Although the inventor of wooden ways obtained only loss and annoyance from his improvement of transportation facilities his invention outlived him and was improved by being covered with sheet iron to prevent the attrition caused by the iron shod wheels. This was "plating" the rails from which the word platelayer comes, the appellation still borne by all trackmen in Britain. The transition from plated wooden rails to rails made of cast iron was easy and natural where iron working was developing. The rails for 150 years after this form of track was first tried were flanged so as to keep a vehicle with plain wheels on the track.

One of the greatest improvements was introduced, 1789, by Mr. William Jessop, when constructing a railroad at Loughborough, in Leicestershire. This engineer decided to abandon the flat wheels and flanged rails, and to introduce iron rails with a flat top, and wheels with a flange cast upon the tire. Mr. Jessop's rail was known as the "edge rail," because the wheels ran upon the upper edge. These rails were of cast iron three feet long, having a single head one and three-quarter inch wide; they were of the "fish belly" pattern, that is deeper in the centre than at the ends, it being considered that it combined the greatest strength with the least expenditure of material; they were fastened to cross sleepers by iron pins or bolts passing through a projecting base cast at the ends of the rails. It was soon found that the cast-iron projections were broken off, and the rails rendered useless, as there was then no way of fastening them: this led to a great and important improvement. The base was removed from the rail itself, and cast as a separate "chair or pedestal;" the plan of bolting the chair to the sleeper, and fastening the rail by means of a key driven between it and the chair is in use to this day.

The long-wrought iron rail was first introduced about the beginning of this century and gradually pushedout its cast iron predecessor.

There can be no doubt that the usual width of the old wooden and cast-iron tramroads practically determined the gauge of our present railways. The usual width or gauge of these old tramroads was *five feet* over all, that is including the width of the two rails, and, as Jessop's edge rails and the Killingworth tramroad had rails one and three-quarter inch wide, it is easy to see that the width of two such rails deducted from five feet leaves four feet eight and one-half inches between the rails, or what we now consider the national gauge. George Stephenson saw no reason to alter the gauge, therefore he adopted four feet eight and one-half inches for the Stockton and Darlington and the Liverpool and Manchester Railways, and when consulted as to the gauge for the Leicester and Swannington, and the Canterbury and Whitstable Railways, he replied, "Makthem of the same width, though they may be a long way apart now depend upon it they will be joined together some day." The "fish belly" rails, fifteen feet long, were adopted for all these lines.

Scraps—No. 2.

BY J. G. TRAMIS.

Assuming that it is a desirable thing for a large proportion of the people of any community to know how to earn their own living, and knowing that a large number of our boys and girls are constantly seeking, unsuccessfully, opportunities to learn trades, the conclusion at once presents itself that either our schools or our industries are not conducted for the best interest of the people.

The reason our industries do not employ more apprentices may be in some instances because of trade's union influence, but in the main it is due to the simple fact that it does not pay, and with this barrier in the way there is no improvement possible except in a change in, or addition to, our present public school system.

The addition of technical or mechanical branches to our higher educational institutions does not apply to the question at all. Whatever may be the original intention, they, from necessity, drift into higher aspirations than that of making mechanics, business men, or trades people, and burden themselves with that which would kill the work of a training school, and that which is a great hindrance to every technical school, doing its best work, viz: *the establishment of a system of examinations and the granting of degrees.* Whatever comprehensive idea the student may entertain of the worthlessness of a diploma, and the value of what he learns when he enters a college or university, the importance of passing the examinations soon overshadows the value of the knowledge gained, and long before the end of his college course the importance of gaining his diploma obliterates every other thought.

The technical branches added to the educational departments, or a purely technical institute partakes, of the character of a college, conforms to college thought and is in general a college with a technical or mechanical attachment. These things are all right in their way, but there are enough of their kind already in this country, and in no way can they benefit the army of young people, who most of all need the opportunities to acquire skill, and that training in the paths of industry, which will render them independent citizens.

That industrial training be introduced into our public schools is no new suggestion, and it may be the only thing that can or ever will be done, but that is not the best thing that could be done, because it is beginning to deal with the subject at the wrong end. The practical training is attached to, and is sure to be made subordinate to the intellectual. The instructors' training in the normal schools is sure to be so steeped in the fancied importance of the standard branches

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LETTERS FROM PRACTICAL MEN.

Moulding a Steamboat Cylinder.

Editor American Machinist:

The engravings represent the moulding, and manner of gating, a 16″x48″ steamboat cylinder, having a 6″ sink head, making the entire length of the casting 54″. As there were a number of these cylinders to make, we made a pattern and an iron flask especially to mould them in. They are moulded in dry sand in a horizontal position, the same as any ordinary mould that is turned over after it has been dried, and the center, exhaust and port cores set. These are made of loam. The two parts of the flask are bolted together through bolt holes in flanges *A A*. The mould is then lowered into the pit and poured in an upright position, as shown in section in Fig. 1. In the back and end elevations, Figures 2 and 3, will be seen the heavy lugs *C*, by which the cylinder is bolted to the bed plate. In making the first one we only gated the casting in the lower flange, at *D*, by as large a gate as we thought would run the mould and secure a perfect casting. The iron seemed fluid enough to run hollow ware (in fact we poured off a floor of hollow ware in the same heat), but in forcing the iron up from the bottom, the upper iron became so dull, that in filling the upper lug it cold shut over the port core opposite the lug, at *B*, in Fig. 2, the iron at that point being $\frac{3}{8}$″ thick.

In making the second one we used the same size pouring gate, $1\frac{1}{4}$″ diameter, cutting a smaller channel into the flange at *D*. We set a valve gate at *E*, Fig. 1, and cut another channel from the pouring gate into the upper lug. In starting to pour the piece we shut the upper gate off with a clay plug dried on the end of a barbed rod, as seen in section at Fig. 4. This plug is dressed to fit the extreme bottom of the gate, and blackwashed. When the iron has about reached the upper lug the plug is lifted out with a rod through the eye *F*, and by keeping the basin full, fresh hot iron is forced into the upper lug, and sound castings have been the result. ROBERT E. MASTERS.

Performance of the Coventry Boiler.

Editor American Machinist:

The Coventry boiler was in operation during the month of November, in both passenger and freight service, on the Chicago, Rock Island & Pacific Railroad, on the Chicago Division, and for the information of the railroad public, I send yon the following report of the General Master Mechanic:

"Report of performance of the Chicago Locomotive Improvement Company's Locomotive No. 60, during Nov. 1884, on the Chicago, Rock Island & Pacific Railroad, manned by the company's railroad employes:

This locomotive is an eight-wheeled, 17x24 engine, with 5-ft. drivers, mounted with the Coventry boiler.

Although the boiler is 60 inches in diameter, the locomotive rides and "curves" well.

The steam is dry and very little water is worked through the cylinders, owing to the partial superheating of the steam. She is a free steamer. She is plain, simple, strong, and free from complications.

PASSENGER SERVICE.

In 2,000 miles of suburban passenger service, although this boiler is free from netting and spark-arresting devices, it threw no sparks or cinders, and only about one-half the usual volume of smoke. She performed this service well, gave satisfaction, and was always on time.

FREIGHT SERVICE.

1,470 miles of freight service between Chicago and Peru, the locomotive hauled full average trains for this division, with the following consumption of coal: The 1,470 miles were made with 43 tons of coal, which is an average of $34\frac{1}{5}$ miles per ton of coal, including coal burned while getting up steam and during stops. The fuel was (LaSalle) Illinois coal.

In this service the indicator was applied to the cylinders of the engine to determine the amount of back-pressure due to the extra length of the exhaust pipes, and no more back-pressure was found than in ordinary locomotives. The pyrometer was attached to the front smoke box, and it was found that from 700 to 900 deg. Fahrenheit, while working, was the temperature of the gases returned through the upper flues, with double $3\frac{1}{8}$ nozzles, and which is always thrown away in the ordinary boiler.

(Signed), T. B. TWOMBLY,
Gen. M. M. C., R. I. & P. Ry.

N. B.—The above was heavy local freight long hours on the line.

From the official statements for the month of November, 1883—the November, 1884, reports not yet being issued—it appears that on freight service, including through as well as local trains, and with substantially the same kind of coal, the average number of miles per ton of coal used on the roads named below, respectively, was as follows:

Illinois Central—Chicago Division....	$22\frac{4}{5}$
Chicago & N. W.—Galena Division...	$25\frac{1}{2}$
Chicago & N. W.—All Divisions, including Passenger, Freight, and every kind of service.....	$25\frac{4}{5}$
Wabash, St. L. & P.—All Divisions, including Passenger, Freight, and every kind of service.....	$25\frac{4}{5}$
Chicago, R. I. & P.—Illinois Division, Freight Service, Sept. 1884, Summer month	$30\frac{1}{5}$

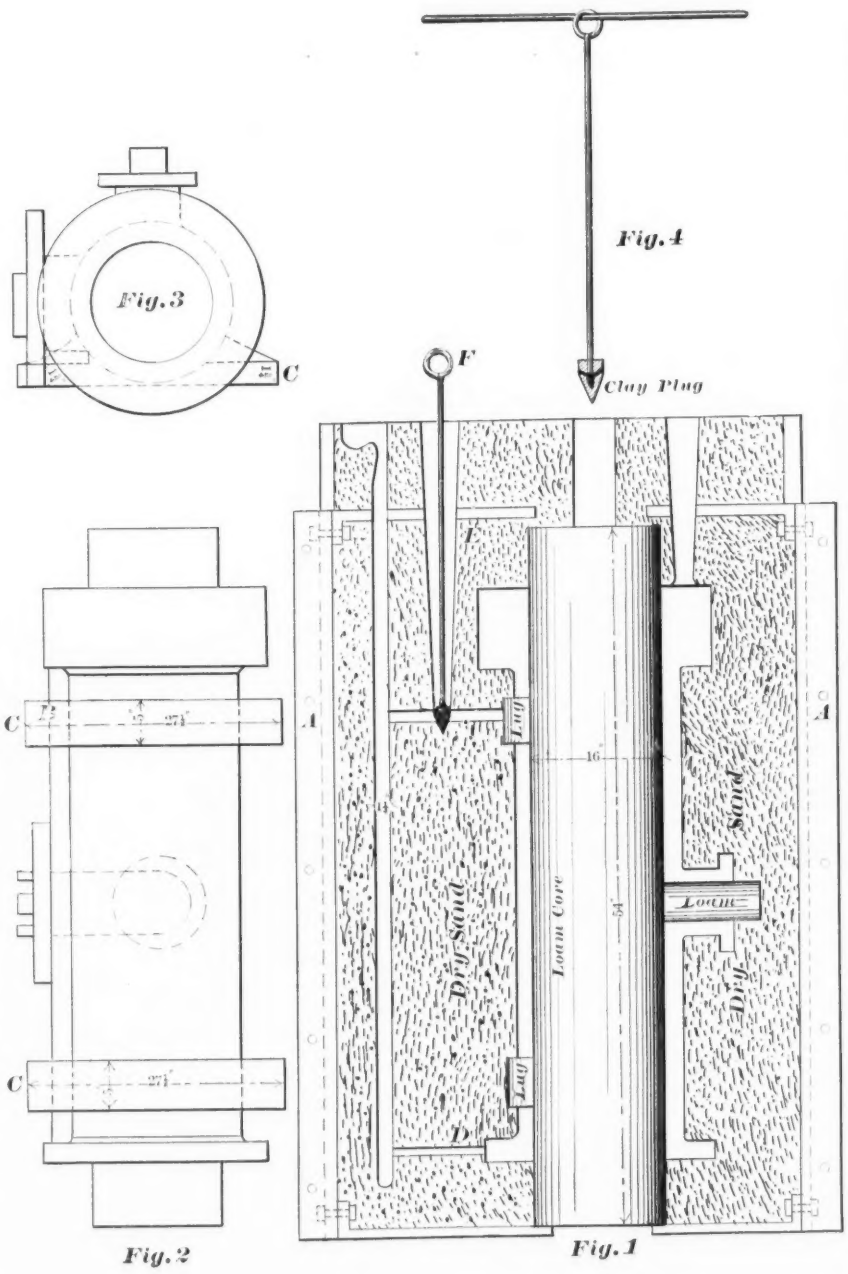
In addition to the above report of Mr. Twombly as to what our locomotive actually did, and to the reports of other railroads given above, I desire to submit:

1. That as compared with the freight record of other boilers using similar coal, she has saved not less than $13\frac{1}{3}$ per cent in the consumption of fuel.

2. That with all things perfectly equal she will save, on the average, from 20 to 30 per cent. of fuel.

3. To hold that she is no better than other boilers is simply to ignore from 700 to 900 degrees of heat, and is to hold that the utilizing of this heat a second time is useless, and that as good results can be obtained by throwing it out of the stack to waste.

C. B. COVENTRY,
Manager Chicago Locomotive Improvement Company, 60 Honore Building, Chicago, Illinois.



The office of tool dresser is an onerous one; that is, it is a peculiarly trying one, and requires not only a good workman, but a good *Christian* to acceptably fill it. He is supposed to please his employer, boss, and in most cases a heterogeneous community of machinists, good and bad—men who know how to use tools properly, and with whom he has no difficulty, and men who do not know how to use them, and whom it is impossible to suit. He is generally kept with his hands full. He has generally work of sufficient variety to do in an hour which, if done as he knows, properly, would require probably half an hour to prepare his fire. But suppose he does that?

Now, I cannot help thinking that "Jim" has got an exceptional position with an exceptional boss and exceptional employer, who in all probability have been in school long enough to appreciate a man who makes success the rule and not the exception, hence his boss, and the machinists, and last, but not least, his employers, bless him.

There is no doubt that excellent results can be produced from best qualities of American steel, but I cannot yet think better than with Sheffield steel, when, suitably chosen material in each instance, regardless of cost, is procured and properly manipulated. But I am open to conviction, and would use the best article at the price, if it were made in Jericho. W. DICKS.

Tool Dressers' Prejudice Against American Brands of Steel.

Editor American Machinist:

Referring to Mr. Goodyear's experiences in tool dressing, I think one reason why tool dressers prefer Sheffield steel is that it can be worked at a higher heat than many American brands, so that, apparently, more work can be done in a given time. Mind, I don't say more profitable work, but what better satisfies the majority of bosses and employers.

Rubber Packing for Hydraulic Presses.

Editor American Machinist:

In the AMERICAN MACHINIST of December 13th, question No. 877, J. S., Bergen Point, N. J., inquires if there is no better way to pack a hydraulic press than by leather packing. I have been using rubber packing with good results in one press with six rams, 12 inches diameter, another press seven rams 10 inches diameter; the working pressure being 1,100 lbs. to the square inch, and have tested them to 3,000 lbs. to the square inch, the packing lasting several months and worked day and night. Should one give out, it is only the work of a few minutes to put another in. The rubber must be moulded to the size; the ram must also be in proper shape to pack tightly. J. T. RIDGWAY.

Correction of Boiler Criticism.

CENTRAL PACIFIC RAILROAD,
OFFICE OF GENERAL MASTER MECHANIC,
Sacramento, Dec. 8th, 1884.

Editor American Machinist:

In the last number of the AMERICAN MACHINIST, I see you have published a cut of the boiler, blue-print of which I sent you November 11th. In my letter referring to the Coventry boiler, I notice you have omitted one word, making the criticism somewhat inexplicit where it reads: "In the case of the Coventry boiler, if it was built to burn coal, I think it would do very much better if the *large* tubes were leading from the furnace instead of from the forward connection to the smoke-arch." The word "large" does not appear in your paper. The cut of the boiler is very good, and does your paper great credit. A. J. STEVENS.

U. S. Naval Board on Tabor Indicator and Coffin Planimeter.

A board of United States Naval Engineers that recently experimented with indicators and the Coffin planimeter, report as follows: "The Tabor indicator is well and accurately made, and embodies in its design all of the best features of the latest improved instruments of other makers, excepting the ratchet stop drum, and besides it has several new and advantageous features not found in any other instrument; such as the means employed to give rectilinear motion to the pencil, thereby dispensing with the need of a parallel bar which is the most fruitful source of derangement in other instruments. The use of a duplex spring gives an equal support to opposite sides of the piston and renders a trunk guide no longer necessary. The general reduction of the weights of the moving parts consistently with their strength, thereby reducing their momentum to a minimum, makes the instrument more reliable as a measurer of power. For the reasons above given, the Board recommends that the Tabor indicator be purchased for use in the Navy Department."

Of the Coffin planimeter they say: "Tests were made with this instrument in measuring a number of geometrical figures of different forms and dimensions of known area, and its accuracy was fully established. The arrangement is simple and convenient in form, and by its use both time and labor can be saved in computing indicator diagrams and other irregular figures, and the Board therefore recommends its purchase for use in the Navy Department.

Tannekaya bark, a new agent used in tanning leather is, to some extent, imported from New Zealand, the cost of the bark there and the freight bringing the price up to about $80 per ton. It is thought that this tree would grow in the Southern States if transplanted. It is a beautiful tree of the fir species, and its timber is said to be valuable.

The American Brake.

The American Brake Company's officers say that their steam tender and driver brakes are now on over one hundred of the best railroads in the United States, and that many master mechanics acknowledge this the best brake in use. The Boston and Albany Railroad and other Eastern railroads are putting these brakes on their passenger engines as a safety appliance. Taking steam direct from the boiler they are always more reliable than devices dependent upon auxiliary mechanism.

Mr. Leigh, Secretary of the company, writing about the merits of the brake says: "It is very simple, yet effective, and can be used to the utmost limit without injury to the parts of an engine. For years they require no repair for ordinary wear except the renewal of shoes. The tender brake is operated independently of or simultaneously with the driver brakes by means of a simple valve."

The Inertia Diagram.

BY ED. F. WILLIAMS.

SEVENTH PAPER.

TABLE FOR CONSTRUCTING INERTIA CURVES.

As the process of calculating the inertia at a sufficient number of points along the stroke to determine the form of a curve representing the forces at all points is both delicate and tedious, I have arranged a table which will give these forces at both ends of the stroke and at four intermediate points (the second, fourth, seventh and ninth ordinate lines). Through these seven points a curve of fair correctness can be drawn by the use of a common wooden or rubber curve, such as may be obtained of most any dealer in draftmen's materials. The table considers 22 different conditions of stroke and rotative velocity, and the connecting rod is considered in all cases as being six times the length of crank, or three times the stroke. The numbers represent the force in terms of weight of reciprocating parts entire, namely: piston, piston rod, crosshead, and connecting rod, and the direction of the force is along the line of connecting rod and exerted upon the crank pin.

In order to obtain the force per square inch of piston it will be necessary to multiply these numbers by the weight ratio, that is the weight divided by the area of piston. It must be borne in mind in using this table that numbers 0, 2 and 4 are for back or cylinder end of stroke, while 7, 9 and 0 are for front or crank end. The forces for back end should be drawn under the neutral line for the backward stroke, and over it for the forward stroke. The forces at the front end should be drawn under the neutral line for the forward stroke, and over it for the backward stroke. Or a still better method is to draw the inertia curve under the neutral line at back end and over it at front end. Then put the indicator diagram for forward stroke bottom side up below the neutral line, and the indicator card for backward stroke right side up above it, or put the reverse, as per Fig. 12. This will be found the most convenient mode of arranging the steam and inertia diagrams for comparison. Upon the line X' X' I have drawn the resultant forces upon the crank pin. The table furnishes a ready means of laying out inertia curves, which will be appreciated, I have no doubt, by those interested in the subject. It is not as nearly correct as it would be were the calculations carried out further into the decimals, but the labor of such an undertaking is more than I can put upon myself just now; so I have used graphic methods, which in the main are correct, not so exact as to small quantities, but generally more correct as to larger ones. I believe the table correct in the main, and as close to the exact truth as can be worked in laying out the curves. It must be borne in mind that these curves will be theoretic only, and that in practice the departure of the parts from mathematically correct movements (by the looseness of joints and springing) will cause the *true* curve of inertia forces to differ more or less from those obtained by the table. The true curve can only be obtained by applying the inertia instrument.

An understanding of the laws of inertia in the steam engine, and an acquaintance with the modes of representing this force, is only the beginning of that education required for an understanding of the effects of inertia together with the steam forces in distributing the strains upon the bearings. A thorough investigation of the subject will lead to conclusions of great value to those interested in the successful performance of steam engines.

The subject of inertia is treated most ably by Mr. Charles T. Porter in his excellent work entitled "The Richards Steam Engine Indicator." To those desiring the best book on the indicator and the laws of "The Application and Development of Force in the Steam Engine," I would recommend this. It is my belief that there has not been a more able and brilliant writer upon these subjects than Mr. Porter, to whom I feel greatly indebted for personal kindnesses, and for a large share of the knowledge I have been able to obtain upon subjects pertaining to the steam engine.

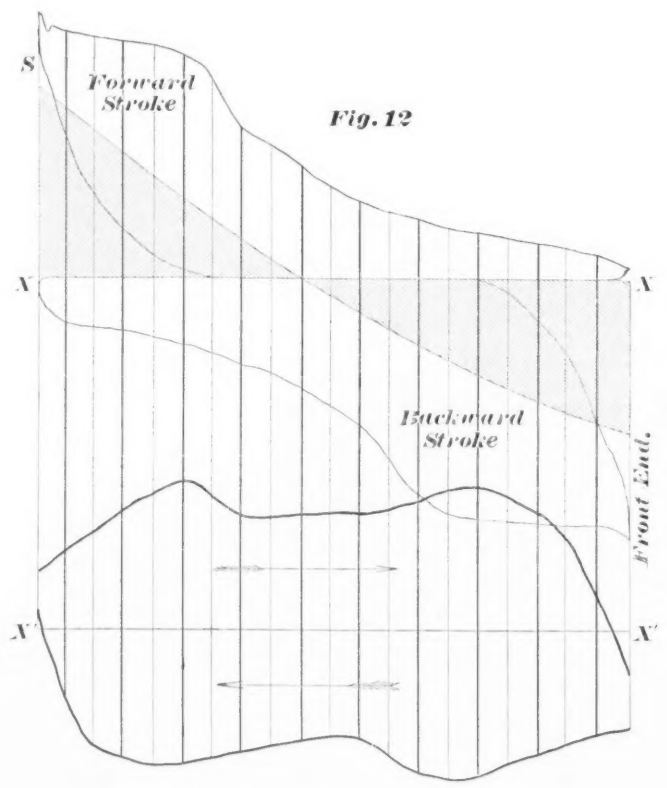


Fig. 12

INERTIA TABLE.—Curve *S S'*.

REVOLUTIONS PER MINUTE.	ORDINATES	STROKE, IN INCHES. 4	6	7	8	9	10	12	13	14	16	18	20	22	24
500	0	16.4	23.9	27.5	22.8	35.5	39.5	47.8	52.6	250 0	16.0	18.0	20.0	22.0	24.0
	2	10.0	15.1	17.5	20.1	22.5	25.1	27.6	32.6	2	10.2	11.6	13.0	14.1	15.4
	4	3.5	5.0	6.0	7.0	7.7	8.8	9.2	11.0	4	3.5	3.8	4.2	3.7	5.1
	7	5.5	8.0	9.4	11.0	12.1	13.7	15.0	17.8	7	5.2	6.0	6.7	7.5	8.1
	9	9.8	14.5	16.7	19.5	21.6	24.2	26.5	31.4	9	9.6	11.0	11.9	13.1	14.5
	0	12.2	18.5	21.5	24.5	27.5	30.5	33.5	39.5	0	12.0	13.6	15.0	16.6	18.3
450	0	12.9	19.4	22.6	25.8	29.0	32.2	38.7	41.9	230 0	13.5	15.6	16.5	18.4	20.0
	2	8.3	12.5	14.6	16.6	18.7	20.8	24.9	27.0	2	8.6	9.7	10.8	11.8	13.0
	4	2.7	4.1	4.8	5.5	6.1	6.8	8.2	8.9	4	2.7	3.0	3.2	3.3	4.0
	7	4.4	6.5	7.6	8.7	9.8	10.9	13.0	14.2	7	4.5	5.6	5.6	6.2	6.8
	9	7.8	10.8	11.8	15.7	17.6	18.9	23.5	25.5	9	8.2	10.5	10.5	11.8	12.5
	0	9.8	14.8	17.3	19.7	22.2	24.7	29.7	32.1	0	10.1	12.6	12.6	13.8	15.2
400	0	10.2	15.3	17.8	20.4	22.9	25.5	30.6	32.1	0	12.6	14.0	15.5	17.0	18.4
	2	6.5	9.8	11.4	13.0	14.7	16.3	19.6	21.3	2	8.0	9.0	10.0	11.0	11.9
	4	2.1	3.2	3.7	4.3	4.8	5.3	6.4	7.0	4	2.7	2.9	3.2	3.5	3.9
	7	3.5	5.2	6.0	6.9	7.8	8.6	10.4	11.2	7	3.4	4.9	5.4	5.9	6.3
	9	6.2	9.3	10.8	12.4	13.9	15.5	18.6	20.1	9	7.6	8.5	9.4	10.3	11.3
	0	7.9	11.9	13.9	15.9	17.0	19.9	23.9	25.3	0	9.5	10.4	11.8	13.0	14.2
375	0	8.9	13.4	15.7	17.9	20.1	22.4	26.9	29.1	200 0	10.1	11.3	12.8	13.9	15.3
	2	5.8	8.6	10.1	11.5	13.0	14.4	17.3	18.8	2	6.7	7.5	8.4	9.0	9.8
	4	1.9	2.8	3.3	3.8	4.3	4.7	5.7	6.5	4	2.8	2.9	3.0	3.1	3.2
	7	3.0	4.5	5.2	6.0	6.8	7.5	9.1	7.9	7	3.7	3.8	4.0	5.1	5.2
	9	5.4	8.2	9.5	11.9	12.2	13.6	16.3	17.7	9	6.8	7.4	7.5	8.5	9.3
	0	6.9	10.3	12.0	13.7	15.4	17.2	20.6	22.3	0	8.0	9.0	9.9	11.0	12.0
350	0	7.8	11.7	13.6	15.6	17.6	19.5	23.4	25.2	27.1	31.3	35.1	38.9	42.8	46.8
	2	5.0	7.5	8.7	10.6	11.3	12.6	15.1	16.5	17.6	20.1	22.6	21.3	27.8	30.1
	4	1.6	2.4	2.8	3.2	3.6	4.0	4.8	5.3	5.7	6.5	7.3	8.1	8.9	9.6
	7	2.6	4.0	4.6	5.3	5.9	6.6	7.9	8.6	9.1	10.6	11.9	13.1	14.5	15.8
	9	4.7	7.1	7.4	9.4	10.7	11.8	14.2	15.2	16.5	18.9	21.4	23.6	26.0	28.4
	0	6.0	8.0	9.3	11.9	13.5	14.9	17.9	19.5	21.9	23.9	26.9	29.8	32.8	35.9
325	0	6.7	10.0	12.0	13.7	15.2	17.0	20.2	22.4	24.6	27.2	30.4	34.0	37.9	41.1
	2	4.3	6.8	7.6	9.0	10.0	11.0	13.0	14.4	15.2	17.2	20.1	22.0	24.5	27.0
	4	1.4	2.0	2.5	3.0	3.4	3.9	4.3	5.0	5.4	5.8	6.8	7.8	8.5	9.0
	7	2.3	3.8	4.0	5.0	5.3.	6.0	6.8	7.4	8.0	9.1	10.6	12.0	12.5	13.7
	9	4.1	6.1	6.9	8.1	9.1	10.2	12.3	13.1	13.8	16.1	18.3	20.4	22.1	24.3
	0	5.2	8.0	9.0	10.3	11.8	13.0	15.5	16.9	18.0	20.6	23.6	26.0	28.4	30.9
300	0	5.8	8.6	10.0	11.5	12.9	14.7	17.2	18.9	20.1	23.0	25.8	28.9	31.7	34.4
	2	3.7	5.5	6.5	7.4	8.3	9.3	11.1	12.0	13.0	14.8	16.6	18.5	20.3	22.2
	4	1.2	1.8	2.0	2.4	2.7	3.0	3.6	3.9	4.2	4.8	5.5	6.0	6.6	7.3
	7	1.9	2.9	3.2	3.9	4.3	5.0	5.8	6.5	7.0	7.8	8.7	9.8	10.8	11.6
	9	3.5	5.2	6.0	7.0	7.8	8.9	10.5	11.3	12.0	14.0	15.6	17.4	21.5	20.9
	0	4.4	6.6	7.8	8.8	9.9	11.1	13.2	14.4	15.5	17.6	19.8	22.2	24.5	26.4
280	0	5.0	7.5	8.9	10.0	10.5	12.5	15.0	16.0	17.3	19.0	20.9	24.9	27.4	30.0
	2	3.2	4.8	5.7	6.4	7.2	8.1	9.7	10.4	12.0	12.9	14.5	16.0	17.2	19.3
	4	1.1	1.6	1.9	2.1	2.4	2.9	3.2	3.6	3.9	4.2	4.7	5.2	5.8	6.4
	7	1.7	2.5	3.8	3.4	3.8	4.2	5.1	5.5	5.9	6.8	7.6	8.5	9.1	10.1
	9	3.0	4.6	5.4	6.1	6.8	7.5	9.1	9.6	10.4	12.2	13.7	14.9	16.4	18.2
	0	3.8	5.7	6.8	7.7	8.6	9.7	11.5	12.4	13.3	15.3	17.2	19.8	21.0	23.0
275	0	4.8	7.1	8.5	9.6	10.8	12.0	14.5	15.7	16.8	19.3	21.7	24.0	26.5	28.9
	2	3.1	4.7	5.6	6.2	7.0	8.0	9.3	10.1	11.0	12.4	13.9	15.7	17.1	18.6
	4	1.0	1.0	1.8	2.0	2.3	2.5	3.1	3.2	3.5	4.1	4.6	5.0	5.5	6.1
	7	1.6	2.5	3.0	3.3	3.7	4.2	4.9	5.4	5.9	6.5	7.3	8.3	9.0	9.8
	9	2.9	4.4	5.0	5.9	6.6	7.5	8.8	9.5	10.2	11.7	13.1	14.5	16.0	17.6
	0	3.7	5.5	6.5	7.4	8.3	9.2	11.1	10.3	12.8	14.8	16.6	18.5	20.0	22.1

Intelligence of Miners.

Some people, not residing in the coal regions, and intelligent in other matters, have been educated to the belief that miners, as a rule, are an illiterate class. This view may have been a just one in the days when coal mines were regarded as dungeons, fit only for the lowest type of humanity, rather than working places for the nobler class. Coal mines of the present day, however, have no resemblance to those of the past, and they are gradually becoming as healthful and agreeable as the best workshops on the surface, and are occupied by many intelligent and competent persons. The general condition of the mines has been greatly improved during the last decades, as has also the qualifications of the workmen employed therein. The improvement, it is well known, grew out of necessity, but not without the aid of the law. The risks naturally associated with mining, and the superior talent and ingenuity required to avoid sad catastrophes, demanded the application of improved methods and the employment of skilled workmen. Simultaneously with the improvement in the general condition of coal mines came also increased danger and more difficult circumstances, owing to the venturous disposition of the people engaged in the hazardous industry, who went farther into the bowels of the earth where danger lurked more abundantly. Thus additional laws restricting the producer were necessitated, and the application of greater care and scientific skill was demanded as rapidly as the importance of the industry, and the value of the lives of the workmen engaged therein, became generally recognized.

Such is the nature of the progress of this industry at present. The conditions under which coal can be extracted are daily becoming more difficult. Simple methods of operation are gradually replaced by more extensive ones. And to facilitate these varying conditions without a proportionate increase in loss, and to overcome the increased obstacles naturally met with, technical knowledge must be enhanced and more intelligent workmen must be employed. No industry at present so strongly demands the employment of competent men as that of mining. This fact is each day becoming more apparent.—*Mining Herald and Colliery Engineer.*

Engineers' Club of Philadelphia.

At a recent meeting of this club, Mr. John Haug presented a description, illustrated by drawings and test specimens, of Mr. William Astor's new steam yacht, the first sea-going steamship built of steel in this country. She is 235 feet long on load water line, 30 feet beam and 20 feet deep, and has two complete decks of $\frac{1}{4}$ inch steel plates. Her machinery consists of a compound engine, with cylinders 34 and 60 inches diameter and 36 inches stroke, supplied with steam of 85 lbs. pressure by four oval boilers built of steel, and having 170 square feet grate surface and 4,200 square feet heating surface. Her hull and machinery have been arranged according to Lloyd's rules for a class of 100 A 1, and she has been specially surveyed while building. Lloyd's rules for steel vessels require a material having a tensile strength of not less than 27 nor more than 31 tons per square inch, having an extension of not less than 16 per cent. in a uniform length of 8 inches. Steel of greater tensile strength has been found proportionately deficient in ductility. The plating for the above vessel, supplied by the Danville Iron and Steel Company, of Danville, Pa., was found to be of very good quality, the tensile strength varying from 62,000 to 72,000 lbs. per square inch, the extension (in 8 inches length) from 20 to 24 per cent., as shown by several samples. Some samples showed as high as 90,000 lbs. tensile strength, but the extension was only 6 to 10 per cent., rendering it unfit for use. The steel for the boilers was also of superior quality; one test piece, cut diagonally from a plate, showed no difference from others cut lengthwise. A test piece, with punched hole, broke at 57,000 lbs., while one with a drilled hole broke at 61,000 lbs., showing less difference than is generally supposed. Some pieces, bent double, after having been heated and quenched in water, showed a remarkable softness and ductility. The material for the

frames and beams of this vessel was supplied by the Pencoyd Iron Works, and fulfilled the requirements of the rules, as shown by numerous test pieces.

Mr. Fairman Rogers described the steam yacht Magnolia, built in 1882 by the Herreshoff Manufacturing Company, Bristol, Rhode Island. The following conditions were required to be fulfilled in her design: Light draft, not more than 4 feet; length and breadth such as to enable her to pass through the Erie Canal locks, which are 100 × 18 feet; flat floor; large accommodations for cruising and for a long residence of the owner's family on board; flush deck; no projection of steam drums, etc., above deck, except the smoke-stack. Low speed, not less than 8 miles per hour. Minimum head room below, 6 feet 6 inches. Adapted specially for inland cruising along the Atlantic coast. She turned out to be entirely satisfactory. Her ordinary speed is 10 miles; maximum, 11½ miles. She has twin screws 36 inches diameter, 50 inches pitch; two compound condensing engines, 6 inches and 10½ inches × 10 inches — 45 lbs. steam, 270 turns per minute. Two flat coil square boilers. Entire motive power weighs five tons. Consumption of coal (anthracite) 165 to 200 lbs. per hour. Carries 15 tons. She is schooner-rigged and sails six knots, dragging her screws. Bent oak frames, 3 inches × 3 inches; yellow pine planking, 2⅜ inches; white pine deck, 2 inches; mahogany rail and deck fittings.

Self-Feeding Locomotive Furnace.

A great many attempts have been made to devise self-feeding apparatus for furnaces, and in Britain a patented arrangement for this purpose has met with some practical application. Nothing of the kind has ever met with much success this on side of the Atlantic, yet we note that a Boston inventor proposes applying a self-feeding combustion apparatus to locomotives. The invention which is patented by William L. Lowrey consists of the necessary apparatus for feeding the fuel by gravity from a closed magazine into a horizontal unobstructed and grateless combustion-chamber wherein the body of the fuel is fed forward as required. The combustion of the fixed carbons and hydro-carbons distilled from the coal is effected at a point near where they enter the combustion-chamber, controlled jets of air being introduced for the purpose.

Rhode Island Locomotive Works.

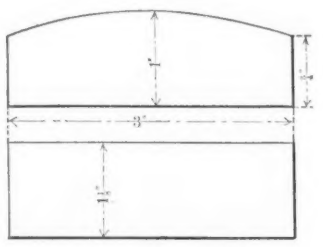
The Rhode Island Locomotive Works are building thirty engines for the Brooklyn Elevated Railroad Company, and ten passenger and three shifting engines for a Western road. They have a large experimental engine nearly ready for the Locomotive Improvement Company, Toledo, O., and they are getting out drawings for a group of Forney engines intended for the New York and Providence Railroad. They are putting in a new steam transfer table, with all latest improvements, which will greatly increase the convenience of the works. A convenient device used in the drawing office of these works is a substitute for a T square. It consists of a straight edge, kept parallel with top and bottom of board by the same arrangement used in a parallel ruler.

The people of Talbottom, Ga., refused to buy a fire engine, and insurance rates have been increased a hundred per cent. Now they are beginning to think that the engine would have been cheaper.—*Fireman's Herald.*

We understand that the *Marine Journal*, now published in Cincinnati, is going to remove its headquarters to New York. The editorial staff of the paper will be strengthened by Captain George L. Norton, supervising inspector of steamboats, becoming associate editor. The *Marine Journal* is a bright newsy paper, and we have no doubt but its sphere of usefulness will be greatly widened after it gets properly established in the marine headquarters of the country.

Hardening Pieces of Steel.

Can you or any of your readers give me the best way of hardening pieces of steel like the shape below? I want the rounded part to be very hard. What I want is the piece to come out of the salt water as it goes in, or as nearly so as possible, being perfectly straight on the sides. F. C. F.



We referred the above communication to S. W. Goodyear, who replies as follows:

As to hardening the pieces of which you send sketch, the main thing is to harden at the lowest possible heat which will produce the degree of hardness required. By having a stream of water under considerable pressure, the pipe from which it emerges having its delivery some few inches beneath the surface of the water in which the piece to be hardened is immersed, thereby giving the advantage of conducting the heat from the entire piece rapidly, but at the same time more rapidly from that part which is held against the greatest pressure of water from the pipe, with a little experimenting and close observation much may be done to modify and suit to the necessities of the case the changes in shape and volume which are the almost inevitable result of hardening. The stream of water under pressure may be directed upward, or downward, or horizontally, or there may be two or more streams aiming at a common center, calling for the piece to be hardened to be immersed above, below, or between them as arranged.

Aside from any question of expansion or contraction, *per se*, as a result of hardening, about which there has been much dispute, scientific and otherwise, there is the fact that in a heated condition steel is largely expanded and must contract to some extent unequally in cooling, inasmuch as it is impossible to cool the entire piece simultaneously. Now, while it is almost certain that such pieces of steel as information is needed about will change somewhat, it is possible by manipulation of the stream of water referred to, to make the side which would naturally be convex be instead concave, or practically straight, at will. If absolute perfection is required, I would advise making the pieces enough larger than required when done to allow for grinding after hardening, recognizing the fact that they must inevitably change in hardening, and that the change as between different pieces will differ, the changes coming largely from purely mechanical causes, which cannot be controlled entirely, although they may be to some extent modified.

Acme Special Bolt Cutter.

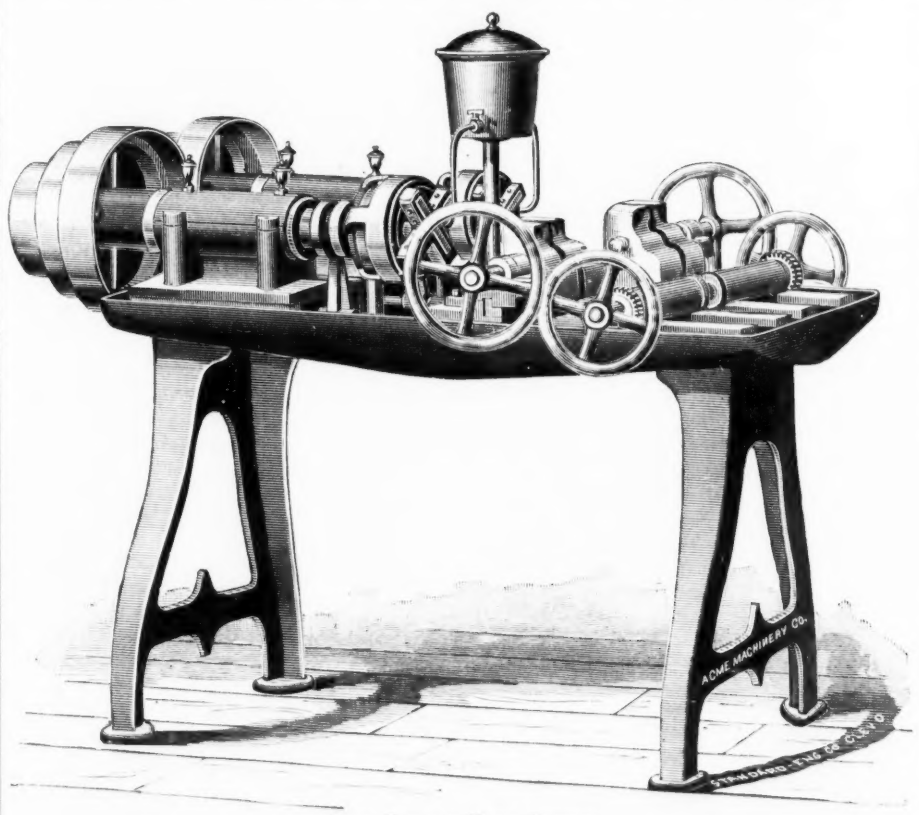
This machine is designed more especially for use in bolt factories, and in agricultural and other works where large quantities of bolts are made, and hence rapidity of action is especially an object.

The dies used in this machine are of very simple construction, being plain pieces of steel cut off to length and threaded with a hob. They are secured in jaws or holders by set screws against their sides, but have no screws against their upper ends. The adjustment of the dies is accomplished by a ring, which by a slight revolving movement brings all the dies towards or away from the center. By the means employed the dies have a solid end bearing in the jaws, and will not upset and cause trouble.

The adjusting ring surrounds the jaws, thus preventing springing, but at the same time is not over the dies, the scale and cuttings from which drop out of the way without danger of clogging the operation of the ring or other movable parts.

The adjusting ring is surrounded by another ring, which is made fast to it. This, by means of a clutch draws the adjusting ring backward and forward, so as to open and close the dies automatically. This operates to open the dies at such a length of thread on the bolt as it may be set for by the operator, and is very quickly adjusted to any desired length of thread.

The machine is simple, and is well made. It is manufactured by the Acme Machinery Company, Cleveland, Ohio.



ACME SPECIAL BOLT CUTTER.

Machinery to Decide the Power of Nations.

When the matter is closely considered, the fact is apparent that ever since weapons superior to the club have been used in warfare the skill of the artisan has done more to decide the ways of battle than it has been credited with; but it remained for modern mechanical skill to reduce war to a conflict of mechanism. The importance that military mechanism has attained of late years is very forcibly illustrated in a paper on "The Establishment of Steel Gun Factories in the United States," read by Lieut. W. H. Jaques before the United States Naval Institute, and published by that organization. Lieut. Jaques has enjoyed the very best facilities for studying out the most approved methods of gun and armor construction, for he was a member and Secretary of the Gun Board that was sent by the United States Government to Europe last year to investigate military mechanism in the leading armories and arsenals. The paper forms a book of 909 pages, and describes in lucid shape the machinery and operations of nearly all establishments where heavy ordnance is manufactured. A great many wood cuts are used to illustrate modern guns, the method of their production and the effect their shot has upon targets.

The conclusion we arrive at after a careful perusal of Lieut. Jaques' paper is, that the plant and machinery now employed in European arsenals and workshops for producing and finishing munitions of war is about the most elaborate and expensive apparatus ever erected for any purpose.

Our own facilities for the production of the steel needed for modern ordnance construction is carefully described, also our machinery, tools, and plant adapted for forging and finishing the same. Our capabilities compare very unfavorably with those of nations that may be regarded as small rivals if their material wealth be compared with our own. In the metallurgical processes required for the peaceful arts, this country has made amazing progress in the last quarter of a century; but in producing the munitions of war we have retrograded. Before the introduction of rifled cannon and the use of steel as the material for their construction, the United States boasted of her Dahlgren and Rodman cast-iron guns, which were the models for imitation and the standards of comparison of all nations. While the rest of the world has advanced with the progress of the age, the artillery of the United States has made no step forward. Its present condition of inferiority is only the natural result of such want of action.

Killed By Electricity.

Another death by ignorant or careless interference with a high tension electric circuit has been recorded. An engine driver at Messrs. Bolckow, Vaughan and Company's steel works, at Eston, imagining that an arc light had "gone out," touched the lamp with the apparent purpose of adjusting the carbons. In the absence of expert evidence it is difficult to assign a cause for this mishap, but it probably arose from simultaneous contact with the positive and negative sides of the lamp while the arc was broken or from defective insulation elsewhere in the circuit, enabling a derived earth current to be made through the body of the unfortunate man. In either case the system is at fault, and if it is found impracticable to effectivelv insulate every part of a high tension circuit, steps should be taken to prohibit the use of series lighting with all its advantages. This would be a serious attempt and as an alternative it might be well to put the person or persons in future responsible for such installations on their trial for manslaughter, for there can be no moral doubt that if by their ignorance or neglect a fatal accident arises, they are guilty of constructive homicide. The experiments made by Goulard and Gibbs, on the Metropolitan railway showed beyond question that the most dangerous alternating high tension currents could be safely dealt with, and these experiments have been confirmed by others.

It is a pity that electric installations are so often carried out by untrained men; too often it is thought that anyone who has handled a telegraphic instrument or run a telephone wire can put down an electric lighting plant, and many accidents have arisen from this cause. As electric lighting grows in importance this will doubtless be remedied, but meantime the incompetence of many of the persons employed in the industry is a prolific source of danger.—*Mechanical World.*

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EDITORIAL ANNOUNCEMENTS.

☞ *Positively we will neither publish anything in our reading columns for pay or in consideration of advertising patronage. Those who wish to recommend their wares to our readers can do so as fully as they choose in our advertising columns, but our editorial opinions are not for sale. We give no premiums to secure either subscribers or advertisers.*

☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen and all those especially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, JANUARY 3, 1885.

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The New Orleans World's Fair.

The World's Fair at New Orleans opened with proper ceremonies on the 16th, with a great crowd of people present. The buildings are the largest of any exposition ever held, and when all the exhibits are in place its attractions will probably not be exceeded by any other. The season was well chosen for the Fair, as well as the location. There is hardly a city in this country in which a great industrial exhibition could be held during the heated term of summer without considerable discomfort to visitors. Hot weather was severely felt during most of the time covered by the Centennial Exhibition at Philadelphia. No such inconvenience need be feared at New Orleans. The mild weather of that city in winter will be especially enjoyed by visitors from the North, and all the attractions may be viewed without being oppressed by either extreme of temperature.

It is no secret that the most welcome foreign visitors to the World's Fair now open will be those from Mexico, Central America, and South America. To those countries we look for a valuable extension of our foreign trade. They import over three hundred million dollars' worth of foreign goods every year, and we supply but a little more than a quarter of these. On the other hand, we buy more than twice as much from the nations south of us as we sell to them. We need to sell more manufactured articles to those countries, such as they are importing from Europe. The extension of our trade must be southward rather than across the Atlantic. The New Orleans Exposition is one of the best agencies to promote that extension. As a general rule, the people of Spanish-American countries have no prejudice against the products of the United States. The reason we have not secured more of their trade is because we have not cultivated their trade as have our transatlantic rivals. The Exposition will help to make a closer commercial union of American republics and the Empire of Brazil, which will be to our permanent advantage. If legislation is needed to help the trade, the Exposition will develop a strong popular feeling in favor of such legislation by way of reciprocity treaties, provided the interests of our home manufacturers remain protected.

Running into a Land Slide.

The capability of the American railroad passenger coach of modern build to successfully withstand concussion was well illustrated in an accident that happened on the New York, West Shore and Buffalo Railway last week. The Atlantic express, consisting of one baggage car, three coaches and four sleepers, pulled by one locomotive, was rushing eastward in the dark of the morning, making up time, when the engine dashed into a land slide, wrecking the whole train. When the train struck the obstruction the speed could not have been any below thirty-five miles an hour, for the land slide took place on a sharp curve, and the engineer received warning of the danger only about one hundred feet before the engine was plowing into the hill-side that had slipped on the track. The engineer made the best use of his time by applying the brake, but the shock of concussion was so great that the first cars were torn away from the engine and forced through loose earth and rocks on to a bank eight or ten feet above the track. Although badly wrenched, the cars held together, and nothing happened in the smash to seriously endanger the lives of any of the passengers. The engine-men were not so fortunately situated, however, for the locomotive turned on her side and the cab got torn off, throwing the occupants violently among the rocks. The engineer escaped with slight injuries, but the fireman was seriously injured.

The subsequent fate of this wrecked train was of a nature that will some day result in a holocaust that will arouse American travelers, so that panic laws will be passed to compel railroad companies to adopt some of the safe methods that have been invented for heating railroad cars. The stove of one of the coaches was torn from its fastenings, and promptly set fire to its inflammable surroundings. As usual in a case of the kind, no means of extinguishing the fire could be found, and the flames spread rapidly, so that five out of the eight cars were consumed. That the greater part of the passengers were not cremated alive, as happened at Ashtabula, Algona and other horrible railroad accidents, was not due to any special provision being made against such a consummation on the part of the railroad company.

Spring Meeting of the Mechanical Engineers.

It is proposed to have the regular Spring meeting of the American Society of Mechanical Engineers some time in March on a Mississippi River steamboat. The plan is for the sessions of the Society to begin after the boat leaves Louisville, and to continue until it reaches the great Exposition at New Orleans—about four days in all. We commend this programme as being the best that could be devised for the Spring meeting. Most of the members would doubtless like to attend the Exposition, and when they can participate in the regular meeting of the Society on the way to New Orleans, the opportunity seems to be excellent. Hotel accommodations will be afforded on the boat, which will probably be found convenient for members to retain while stopping at New Orleans instead of patronizing overcrowded hotels.

This plan for the Spring meeting does not admit of any excursions to interfere with the sessions for business, and quite a number of papers should be read and discussed.

A Practice that Needs Reforming.

One of the most reprehensible practices of the present time is that of the management of various institutes of "practical instruction" in promising to obtain lucrative positions for students as the reward for paying for a short course of instruction. Hundreds are induced to enter schools of this kind, generally to find themselves disappointed in the end; something, perhaps, a little short of swindled in a legal sense, but very near it. It ought to be apparent that the teachers or managers of these schools cannot create places for their "graduates" beyond the ordinary demand, nor fix the pay they will receive, but promises to do both are freely made. The demand for workers in specific directions, and the wages paid, are things over which these teachers and managers have no control. We have no fault to find with enterprises of this kind when the business is legitimately conducted. They are—such of them as have a respectable standing—doubtless of considerable utility. But when they offer as inducements positions which it is clearly out of their power to bestow—offer them in such a way that legal redress is impossible when they fail to fulfil their promises—their conduct is fairly open to criticism. This is done, as previously intimated, in some instances by those who would not be suspected of such practice, and to such an extent as to make a word of warning not out of place.

It is plain that the interests of these schools and the interests of their pupils are to a great extent opposed. That is, those pecuniarily interested in the school enterprise are anxious to instruct the largest possible number of students, notwithstanding the business for which they are being fitted is entirely overdone, while those applying themselves, as students, to the mastery of the business, are desirous that the demand shall exceed the supply. Here is just where the promise of having employment secured comes in to entrap the unsuspecting into something their judgment condemns.

The anomaly is actually presented of the probability that the school of this class that can make the best showing in point of number of graduates, has forced the supply beyond the demand, and so presents the least advantages for those who enter in search of an occupation. Those thinking of entering schools to learn some special branch of work, or business, should settle the matter entirely by their own judgment, as to the probable value to them of the knowledge they are satisfied they can acquire, and should not be influenced to any great extent—perhaps it would be better to say they should not be influenced in any degree—by promises of situations to be secured for them. If they cannot see, before entering themselves as students, that if they already knew what they expect to learn they could find employment *for themselves*, the probability is that, after spending both time and money, they will be no better off. Those conducting such schools should reform their practice to the extent indicated.

The assumption that men working in special lines of industries are interested in technical literature only so far as it applies to the field in which they are at the time engaged is generally erroneous. A machinist, for instance, has an interest in literature relating to the operations of the craft; but to suppose that his interest in technical literature goes no further than this is to suppose that he has no ambition beyond boring, turning and planing. Whether a man is working in a machine shop, foundry or boiler shop, or is in charge of boilers and engines, as engineer, he is not only reading in matters pertaining to his work, but is no less—frequently more—interested in allied mechanical subjects about which he must know something to materially advance himself. He is always interested, and properly, in reading outside his immediate needs. The machinist recognizes that as foreman he will feel the need of some knowledge of pattern-making and moulding, and the pattern-maker, if in charge, must know something of machine work, and a good deal of moulding. So the moulder is always better for some knowledge of practice in other departments, and the engineer is interested, or expects to be, in them all. Any of these may be—most of them hope to be—called to positions where a general knowledge of mechanics and engineering is important, if not indispensable, and hence are always interested in such subjects. Because matter is more particularly addressed to boiler-makers, for instance, it does not follow that it will be read more by members of that trade than by those of other trades.

We publish, on page 5, an interesting article on the power utilized in moving the cars on the Brooklyn Bridge. The article was prepared by A. H. Mathesius, now of 399 Marcy Ave., Brooklyn, N. Y., whose practical experience in such matters renders his conclusions particularly valuable. The proportion of the power developed by the engine that is utilized in moving the cars is, we believe, materially greater than generally supposed.

We conclude this week the series of articles by Ed. F. Williams, on the Inertia of the Reciprocating Parts of the Steam Engine. Owing to the fact that Mr. Williams is busily engaged in engineering pursuits, the articles have appeared somewhat disconnectedly. They will be found in our issues of Aug. 9 and 23, Sep. 13, Oct. 18, Nov. 1 and 22, 1884, and Jan. 3, 1885.

Literary Notes.

In our November 15th issue, we noted that F. B. De Berard and T. A. Kennett intended to issue a new paper devoted to the hardware and stove trades about the first of January, to be entitled *The Ironmonger*, publication offices 419 Broadway, New York, and 150 Dearborn Street, Chicago. We should have noted that the new journal is to be issued monthly, subscription rate $1.00 a year.

We have received advance sheets giving some idea of the appearance and flavor of the new journal. We think the reading

public will like the flavor, and that the new paper bids fair to become a favorite.

HAND BOOK OF PATENT LAW, FOR PATENT Owners. By Chas. B. Mann. Patent Attorney and Counselor. Second Edition, Revised. Published by Mann & Co., Baltimore, Md.

This is a little book of about 140 pages, and contains a good deal of useful information for all who are in any way interested in patents or patent law. In fact, it contains, we should think, all the information any one desiring to apply for a patent, or to buy or sell, would be likely to require. It is well indexed, so as to be ready for reference. The price of the book is 60 cents.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(1) H. B., Port Huron, Mich., asks: Can you give me a simple rule for determining water consumption from indicator diagrams? *A.*—You will find this plainly stated in the AMERICAN MACHINIST of March 1, 1884.

(2) C. S. G., Atchison, Kan., asks: How can I temper small spiral springs, made of brass, after they are coiled? *A.*—Such springs should be made of hard brass wire. There is no way of satisfactorily tempering after coiling.

(3) S. U. Chester, Pa., asks: Has any one discovered a process for hardening copper, and has a reward for its discovery been offered? *A.*—There is no known process for hardening copper in the sense to which you refer, nor any reward offered for the discovery of a process, that we know of.

(4) J. F. H., Arvon, Mich., asks: Will a pump use more steam if it exhausts in the water than if it exhausts in the air? *A.*—Steam pumps are sometimes arranged to exhaust into the suction, by which it is claimed steam is saved. If you mean exhausting below the surface of water, as in a pond or reservoir, it will require more steam to operate the pump.

(5) J. W. H., Jersey City, N. J., writes: I claim that a belt will run to the slack side of the pulley. Others claim that it will run to the tight side. Am I right? *A.*—When the two shafts are parallel the belt will run on that part of the pulleys that is of the largest diameter. If the shafts are inclined towards each other the tendency of the belt is to run off the pulleys towards the ends of the shafts that are nearest together. You will find this more fully explained in the AMERICAN MACHINIST of April 17, 1880.

(6) R. W. B., Pitts, Pa., writes: I wish to put in our factory a fan to run about 1,200 revolutions per minute. The engine has a 6-foot band wheel which makes 75 revolutions. The fan has 10″ pulley. Would it be better to use one or two countershafts, and how fast should they run? *A.*—Considering the slow speed of the 6-foot wheel we are of the opinion that it would be better to use two shafts between engine and blower. You might arrange pulleys as follows: Belt from 6-foot pulley to 3-foot pulley on first counter; from 4-foot pulley on first counter to 20″ on second counter; 3-foot pulley on second counter to 10″ pulley on fan.

(7) W. S. Sherbrooke, Quebec, asks: 1. What is the best book on steam engineering? *A.*—With so many books on this subject that are good, we cannot undertake to say which is best. 2. What are the best rules for finding the horse-power of boilers and engines? *A.*—There are no rules that are of much value. To determine the horse-power you must note the actual performance. 3. If a party builds a small steamboat, say 5 feet beam and 24 feet long, will a license be required if he wants to let it occasionally? *A.*—The size of the boat has nothing to do with the question of license. License will be required as much as for any boat of the same class plying in the same waters. 4. Does a locomotive engineer require a Government license to run? *A.*—No.

(8) C. A. P., Sorel, P. Q., asks: What is the best way to temper round spring steel, as rake teeth, for instance? *A.*—Practice differs in this respect. In one manufactory where rake teeth are made, the following plan is adopted: The bars of spring steel are cut to the proper length, and all the fitting required done. They are then heated in a reverberatory furnace (which must be large enough to heat the pieces uniformly) to a bright red heat, and bent to shape around a former. When cooled to a low red heat they are dropped flatwise into a bath of linseed oil, and allowed to cool. They are then tempered in the same furnace (run quite low), by holding them in the furnace and heating until the temper is brought down. This last operation depends for its success entirely upon the skill of the operator. A good quality of steel must be used, and failures must be expected before the operator educates shimself to secure uniform results.

(9) W. F., Providence, R. I., asks: 1. Do mechanical draftsmen use isometrical perspective, or is their work plain drawing? *A.*—Isometrical perspective is very little used in workshop drawings of machinery. Draftsmen usually understand it, but few find much, if any, use for it. 2. I am a young man, and have worked at the machinist trade for four years. How long time will I require to get a thorough knowledge of drawing? *A.*—It will require as long time to thoroughly master drawing as it will to master any other trade. By hard study for one winter you may be able to get such insight into it that you can make simple drawings, and then perfect yourself by practice. Many mechanics learn to make a very fair drawing, and find the knowledge of how to do so very valuable, but they are not, strictly speaking, draftsmen. 3. What are the advantages of the metric system of measurement over the English system, and would not its adoption be an inconvenience to thousands of workmen who have always used English measurement? *A.*—The chief advantages claimed by the advocates of the metric system are that calculations are more easily made than in the English. Its adoption would undoubtedly inconvenience both workmen and manufacturers.

(10) S. M., Brooklyn, N. Y,, writes: I have an engine 8x14″, plain slide valve, rated at 15 horse-power. Fly-wheel 6 feet in diameter, rim 4″x5″. The engine runs 85 revolutions per minute. Boiler pressure 50 lbs. I want to know: 1. Can I increase the speed to 200 or 250 revolutions and get 20 horse-power from the engine? *A.*—If the engine is properly constructed for that speed, you should be able to get 20 horse-power at 225 revolutions. 2 Is fly-wheel safe at that speed? *A.*—If a well-made wheel, yes. 3. Is the fly-wheel heavy enough? *A.*—At 200 revolutions, or upwards, the fly-wheel is heavier than would be required for any ordinary work. 4. What will be the variation in speed in throwing on or off, say, 12 horse-power *A* —With a good governor the variation should not be noticeable. 5. The pulley on engine shaft is 3 feet diameter. Will a 13 belt transmit the power? *A.*—Yes, if the conditions are reasonably good. 6. I have a horizontal tubular boiler 3x14 feet, 32 tubes 2½″ diameter; grate surface 3x4 feet. Will boiler supply steam for engine, and if more, how many horse-power will be left for heating? *A.*—If you run the engine at 20 horse-power there will not be much margin in boiler for heating. It should just comfortably supply the engine. Cannot you use the exhaust steam for heating?

BUSINESS SPECIALS

Transient Advertisements, 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Curtis pressure regulator and st'm trap. Dec. 13, p.10.

Presses & Dies, Ferracute Mach.Co., Bridgeton, N. J

Katzenstein metallic packing, 169 Christopher st., N Y

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John street, N. Y.

Herbert W. T. Jenner, Mechanical Engineer and Solicitor of Patents, 632 F st., Washington, D. C.

Power Measured—F. Van Winkle, mechanical engineer, 22 Cortlandt street, New York.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York

Consulting Engineer and Mechanical expert, C. C. Hill, 84 Market street, Chicago, Ill.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

The "Wax Process" Engravings shown in the AMERICAN MACHINIST each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 62 Chatham St., N. Y.

Farley's Reference Directory of the Machinists, Iron, Steel, and Metal-Working trades of the United States. A. C. Farley & Co., Philadelphia, Pa.

Improved Tack Machinery, made by The Willets Man'f'g Co., can be seen in operation at their works, 57 Clifford St., Providence, R. I.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant, $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

Locomotive Engine Running. By Angus Sinclair. Price, $2. A handsome, interesting book. Just the thing for a holiday gift. Published by John Wiley & Sons, 15 Astor Place, N. Y.

EXTRACTS FROM CHORDAL'S LETTERS, 400 pages, 12mo., handsomely bound in cloth. New and enlarged edition, with over 50 illustrations. Price $2. Published by John Wiley & Sons, 15 Astor place, New York.

Useful Information for Steam Users—A 100-page pamphlet, on the care and management of the steam engine and boiler, with hints and rules for engineers and firemen. Every engineer should have this book. Send 25c. in P. O. stamps to the J. N. Mills Publishing Company, 145 Broadway, N. Y.

MANUFACTURES.

L. Wagenhouser is building a $150,000 brewery at Dallas, Texas.

W. P. Gilbert, Clifton, Texas, will build a 125 barrel roller flour mill.

There is a prospect of a cotton seed oil mill being established in Dallas, Texas.

A $300,000 bridge will probably be built across the Rio Grande at Laredo, Texas.

The Georgia Pacific Railroad has commenced to build a round-house in Birmingham, Ala.

The Winchester Rifle Works, New Haven, Conn., has just received an order for 25,000 rifles.

Snyder & Belding, Canton, Ohio, is a new firm organized to manufacture a new style of plow.

James Atherton, of Toonigh, Ga., has completed his cotton factory and put in the machinery.

A company is being organized in Fort Valley, Georgia, to establish a foundry and machine shop.

Gen. Geo. L. Cooke, Providence, R. I., is about to erect a large brick building for manufacturing purposes.

The Gainesville Lock Company has been chartered at Gainesville, Tex., to manufacture locks and fastenings.

Large additions have been made to the King Iron Bridge & Manufacturing Co.'s works, at Cleveland, O., which are now being run on full time.

The Ames Manufacturing Company, Chicopee, Mass., have discharged about a hundred men from their machine shops, and are now running on short time.

The Sherman Manufacturing Company, of Jackson, Tenn., are erecting additional buildings, and will put in more machinery for their foundry and machine shop.

The Crescent City Sugar Refinery Company, of New Orleans, La., contemplate altering their buildings and putting in necessary machinery for manufacturing beer.

The Rappahannock Machine Company has been organized at Rappahannock, Va., to establish foundry and machine shop, and also to operate flour and planing mill.

A large consignment of Baldwin locomotives, manufactured for parties in Rio Grande do Sul, Brazil, valued at $79,290, has been shipped to that port from Philadelphia, by the schooner Lena Hunter.

The Billings & Spencer Company, Hartford, Ct., were awarded a silver medal at the Massachusetts Charitable Mechanics' Association Fair in Boston, recently, for excellence of their drop forgings and drop forged tools.

The managers of the Albany & Rensselaer Iron and Steel Works in Troy, N. Y., contemplate enlarging the corporation and building blast furnaces, producing pig iron for use in their works. The projected expenditure is about $600,000.

The St. Louis *Globe-Democrat* says that the Atlantic & Pacific railroad shops at Albuquerque, N. M., are filled with workmen running their tools on double time. The demand for freight cars and coal flats to supply immediate necessities is imperative.

Joseph High & Company, of Pottstown, Pa., are erecting a machine shop and foundry on a piece of Mr. High's property in that town. The foundry building is 30x32 feet, and the machine shop is 18x26 feet, and two stories high. The new firm expect to begin operations about January 1st.

L. Schutte & Company, manufacturers of the Korting injector, have re-modeled the injector to make it go on to the locomotives belonging to the Pennsylvania Railroad without changing the standard pipe fittings. They have received an important order to supply injectors to this company.

A recent fire destroyed the main building of the repair shops of the St Louis, Alton & Terre Haute Railroad in East St. Louis, Ill., involving a loss of something like $15,000. The building was a one-story frame structure, 250 feet long by 100 wide, and was used for repairing locomotives and cars.

A steam fire engine, embodying some new features said to be of great value, will be made and placed on the market next season by Eaton & Prince, of Chicago. The shops of this firm are actively employed on elevator work on orders, and are working a fair complement of men.—*Industrial World.*

The *Chattanooga Tradesman* says: A movement is on foot among a large number of nailers to build a nail factory on the co-operative plan in that city. The scheme is already assuming definite shape. They propose to subscribe $40,000, which will be sufficient to put 50 nail machines in operation. The company will be backed by ample capital.

The Southern Wire Company has been incorporated in St. Louis, Mo., with $50,000 capital. J. W. Gates is president, Wm. Clifford, treasurer, and C. F. Hintze secretary. The new incorporation represents a consolidation of the Southern Barb Wire Company and the Missouri Wire Fence Company. Works of the new company will be at 21st Street and Papin Avenue.

The Pratt & Whitney Company, Hartford, Conn., are running ten hours a day, with a fair supply of orders ahead for their machinery and tools.

Hansen & Amundsen is the name of a concern lately established at 49 West Lake Street, Chicago, as machinists and makers of dies, tools and light machinery. The firm will make a specialty of counting machines for printing presses. New and improved machinery has been put in, and the works are fully prepared for the work proposed.—*Industrial World.*

There are 234 cast-iron stove manufactories in the country, 109 of which are east of the Alleghenies and 125 west of that line of demarcation between the west and the east. Two of these are in Kansas and two in Iowa. States which practically import both their coal and iron. But coal-and-iron-producing Colorado has no stove factory.—*Denver Journal of Commerce.*

The Ewart Manufacturing Company, of Chicago, are moving their plant to Indianapolis, Ind., where they will be incorporated with their extensive foundry known as the Indianapolis Malleable-Iron Works, the officers of the latter company being the proprietors of the Ewart Manufacturing Company. A salesroom will be maintained at Chicago, and a full stock of their manufactures carried.

Horace Thurston, 84 Clifford St., Providence, R. I., sends us a sample of a new electric call button, called the "multiple-contact" button, by reason of a plurality of contact points. Its advantages are its number of contact points, little liability to get out of order, or the bending of the spring over the base or over itself. Mr. Thurston is manufacturing the buttons in large quantities, having a good supply of orders.

The Davis Rock Drilling Machine Company, of Canton, O., is the name of a new company formed for the manufacture of rock-drilling machinery. Drilling apparatus complete, consisting of engine, boilers, etc., will be turned out, and its simplicity and general utility give it promise of great success. Hon. T. C. Snyder, of T. C. Snyder & Co., and Mr. James E. Davis are its projectors.—*Age of Steel.*

J. Webster, president and treasurer of the Novelty Iron and Boiler Works, Dallas, Texas, writes us that we made a mistake in the name when noting the incorporation of that company in a recent issue. We had it Novelty Iron and Bridge Works They build boilers, lard oil and water tanks, also do boiler repairing and sheet-iron work of all kinds. Besides this, they do plumbing, gas, and steam fitting, and have a supply store for plumbing goods and gas fixtures.

The Acme Machinery Company, Cleveland, Ohio, manufacturers of bolt and nut machinery, write us under date of Dec 31st: "We have been and are now as busy as bees working overtime—every day 12½ hours. Will ship one machine to Detroit and one to Akron to-morrow, and a large 3½″ Class A. to Paterson, N. J., the latter part of the week, besides a 1½″ Class A. in this city to G. R. Gale. Have just shipped one each 1½″ Class A Machine to the Globe Ship Building Company, and to the Buckeye Bridge Works of this city.

The Nathan Manufacturing Company are making a new car brass of a novel form. The inside surface of the brass is cast with small cones covering the whole area, and over this a covering of lead is cast. The small, conical protuberances prevent the lead from being squeezed out and the combination of brass and lead wear evenly down to a bearing. This company have recently made alterations on their monitor injector to make it answer the standard fittings used by the Pennsylvania Railroad. They have received a large order to supply injectors for that railroad.

Galvin Brothers, of the Galvin Brass and Iron Works, of Detroit, have recently formed a corporation consisting of F. F. Palms, President; John Collins, Vice President; W. S. Armitage, Secretary and Treasurer; T. Galvin, Manager, and John Galvin, Superintendent. The office and works are on Warren Avenue, near Grand River Avenue, and the capacity is being largely increased by the tearing down of old and the placing in of new machinery, and by the erection of additional buildings. The new works comprise a foundry 40x80′, a brass foundry 60x35′, brass-finishing room 40x107′ two stories, pattern house—fire-proof and separate from main building—30x40′, and office 25x40′. The company hope to occupy the new plant by the end of the present month. Matters are now looking better than before for the company, and manufacturing may be begun next spring.—*Iron Trade Review.*

Gould & Eberhardt, of Newark, N. J., received gold and silver medals for their machinery on the Pacific Coast last year, also silver medals at Cincinnati Exposition, and four medals at the American Institute Fair this year, among them the special medal. They have received numerous orders for their improved machinist tools, from leading houses, and one order from the Cornell University, Sibley College of Mch Arts, for a planer to plane surface plates and other very accurate work. G. & E. are also getting out a new 15″ entirely automatic patent gear cutter, for small, accurate and quick work; also a new 6″ stroke patent shaper, for small die makers, that will sell at a reasonable price. They are continually improving their tools, and although times are close and sales not plenty, they are getting a good share of orders. They have an exhibit at the New Orleans Exposition, composed of a patent automatic gear cutter, a patent shaper, a drill press and an engine lathe.

Machinists' Supplies and Iron.

NEW YORK, December 18 1884.

No new features have appeared in the supply trade during the last week. Business is very quiet, but an impression prevails that the beginning of the year will witness considerable improvement. A leading dealer in machinist supplies recently returned from an extended tour through the West and Northwest, reports that railroads in every quarter are merely buying enough stock to last them within each month. So careful are they to keep down superfluous stock that they will frequently permit supplies to run down so close that they have to t legraph for goods to be sent on immediately to prevent stoppage of work.

Steam supplies are in fair demand, with prices steady.

Iron—No improvement is perceptible in the condition of the pig iron trade. Although prices have fallen so low that it seems impossible for them to go lower, buyers hang off in expectation of obtaining better terms, and the practice of buying just enough to meet current wants continues. Standard Lehigh brands of No. 1 X Foundry are quoted at $19; No 2 X $18 at tidewater; Grey Forge, at furnace, $14 50 to $15 50.

Scotch Pig This market has ruled dull and depressed. The arrivals are light, yet prices are not maintained with any degree of firmness. The quotations are little better than nominal, as concessions are readily made to obtain the small sales that have been the leading feature of business. We quote Shotts, $21.50 to $21.75; Coltness, $22, both to arrive; Glengarnock, $20.50; Gartsherrie, $21.50 to $22; Eglington, $19.50; Langloan, $21.

Copper—This market is badly demoralized. A large quantity of Lake has been sold during the week at 11¾ cents, although the nominal quotation is 12 cents.

✲WANTED✲

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Situation wanted by experienced draftsman. Address D., Box 10, AM. MACHINIST.

Wanted Working foreman for a small foundry making machinery castings. Address "Foundry," Box 98, Indianapolis, Ind.

Wanted—Position as foundry foreman by a competent man who has held similar place over twelve years. Address X. L., AM. MACHINIST.

Wanted Situation by good pattern maker. Address Pattern Maker, Park Hill Ave, Yonkers, N. Y.

Wanted—Position as foundry foreman. Practical, reliable, and temperate. 18 years' experience. Address J. D., Care AM. MACHINIST.

Wanted—An experienced salesman to sell Automatic steam engines and other machinery. Address Box 9, AM. MACHINIST.

Practical licensed engineer, sober, thoroughly experienced with high-speed automatic cut-off engines, wants situation. Address J. C., AM. MACHINIST.

A mechanical draftsman of good technical education and four years' practical experience, desires situation. References Address Draftsman, P. O. D. 38, New Haven, Conn.

A mechanical draftsman and engineer, who has a technical education and 8 years' practice, desires a situation Will refer to present employer and others. Address K. C., AM. MACHINIST.

Situation wanted as draughtsman or at office work by one having ten years' experience as machinist, draughtsman, and bookkeeper. R. P. Brown, Room 10, TRIBUNE Bldg., Chicago, Ills.

Wanted—A foreman to take charge of machine shop manufacturing stationary engines. Address Box 2, AM. MACHINIST, with references, and state where last employed and what salary expected.

A mechanical draftsman of large experience as designer, with shop experience, wishes an engagement. Would prefer an establishment building steam engines of the Corliss type. Best of references. Address E. C. B., care AM MACHINIST.

Wanted—An experienced foreman for a large machine shop. Class of work, stationary engines and general repairs. Must be thoroughly competent to handle men. Give references, where last worked, age, and salary expected. Address Box 6, AM. MACHINIST.

Wanted—One good second-hand planer, 48x48, or 50x50, 10 or 12 ft. bed. Nolan Madden & Co., Rushville, Indiana.

For Sale—No. 2 Long & Allstatter double-power punching-press. Good as new. Address Dueber W. C. Mfg. Co., P. O Box 1334, Cincinnati, Ohio.

Desirable office and desk room in new building to rent. Henry T. Patterson & Co., Machinery, Metals, Tools and Supplies, 19 N. 7th St. Phila., Pa.

For Sale at a Bargain.—A very heavy second-hand Iron Planer, that planes 24 ft. long 62 in. x 62 ft. Good condition and good maker. The George Place Machinery Company, 121 Chambers street, N. Y.

For Sale—Our Worthington duplex steam pump, nearly new, in perfect order, size 4½ x 2¾ x 4. Will be sold low if applied for soon. Address Wm. H. Clapp, Weymouth, Mass.

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PRESIDENT: *His Royal Highness The Prince of Wales.*

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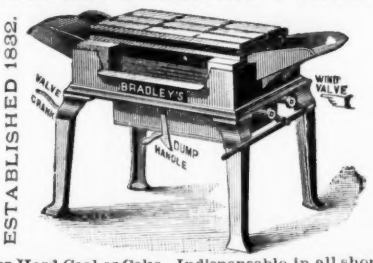

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PUMPING MACHINERY
FOR ALL DUTIES.
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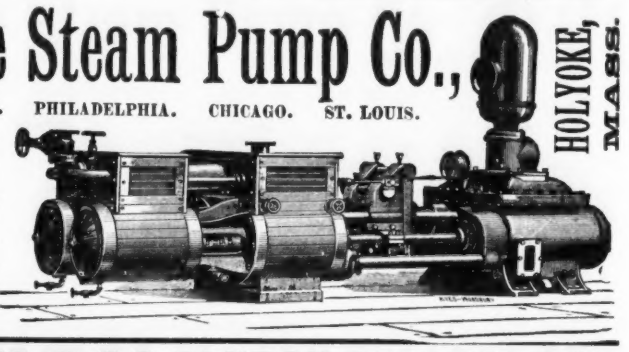

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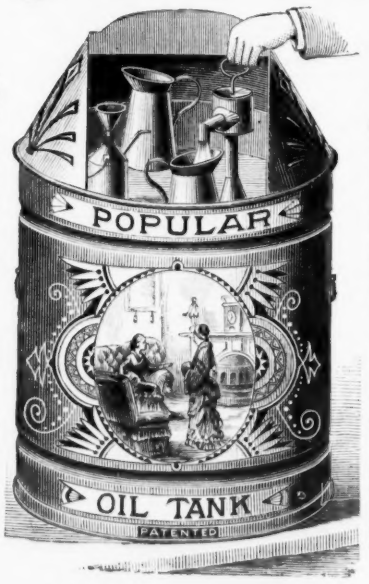

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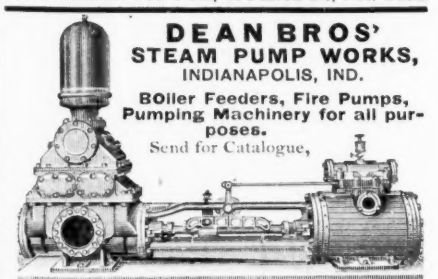

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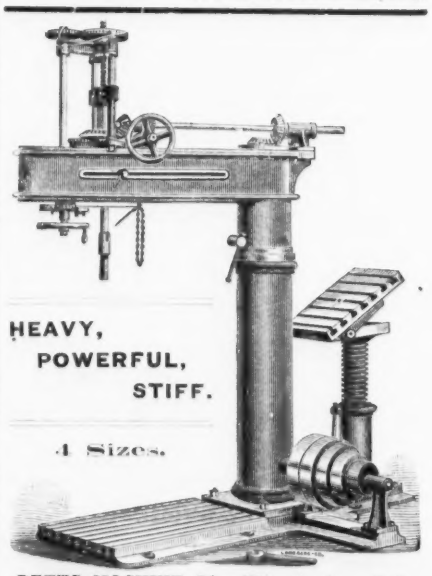

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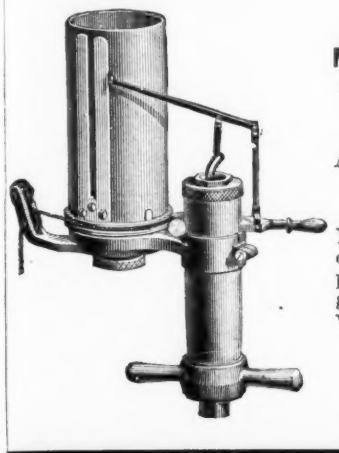

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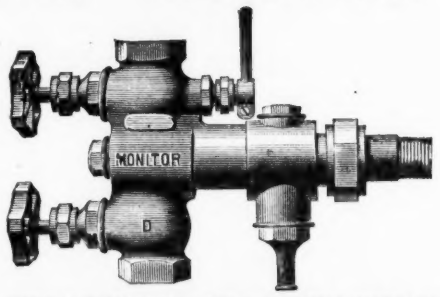

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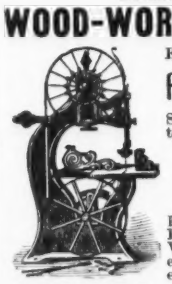

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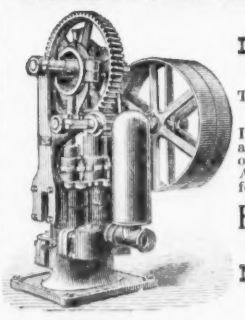

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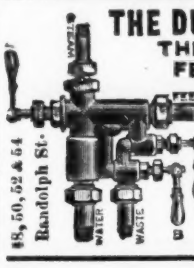

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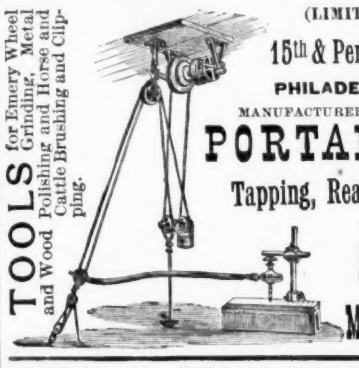

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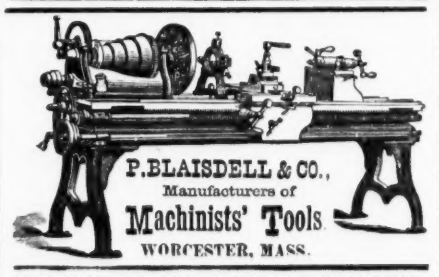

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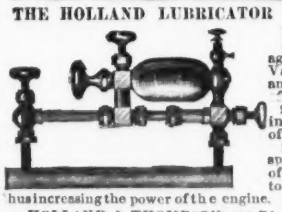

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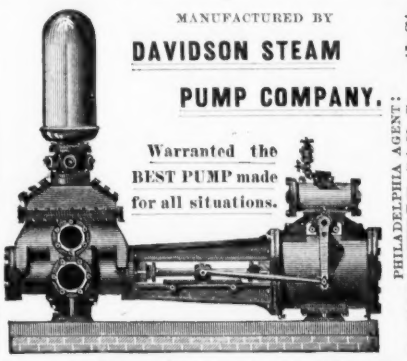

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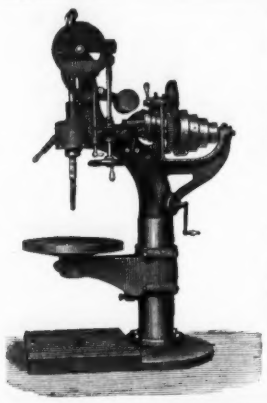

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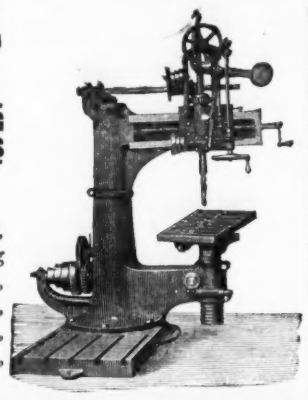

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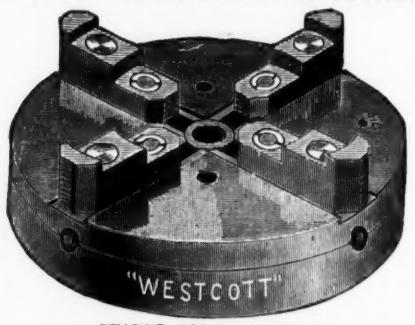

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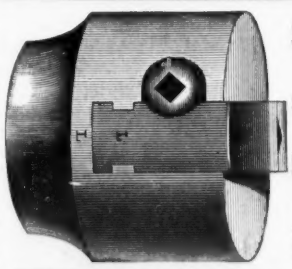

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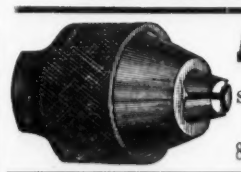

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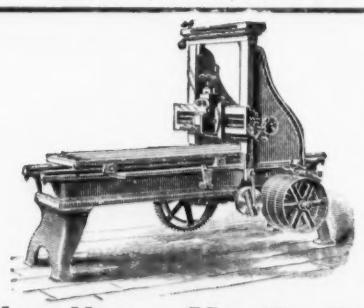

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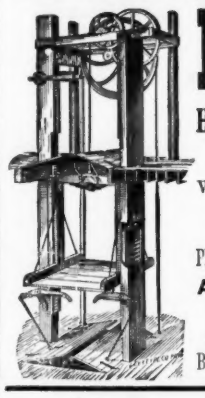

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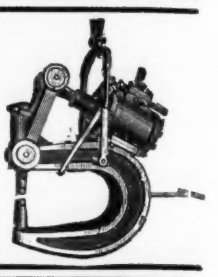

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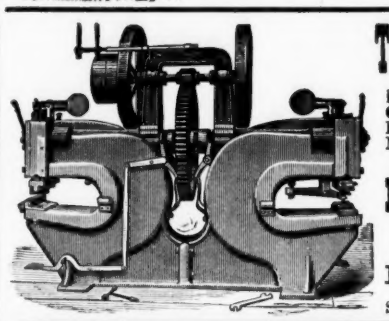

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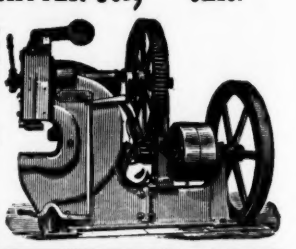

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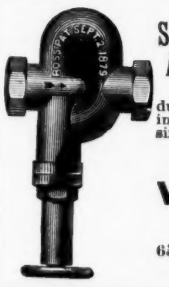

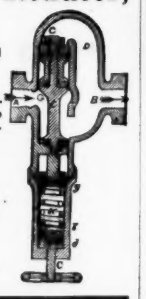

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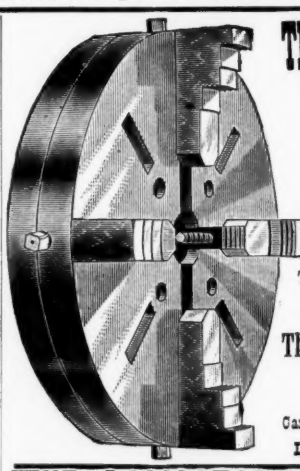

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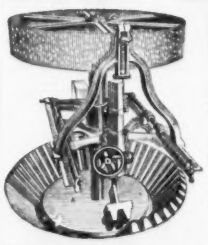

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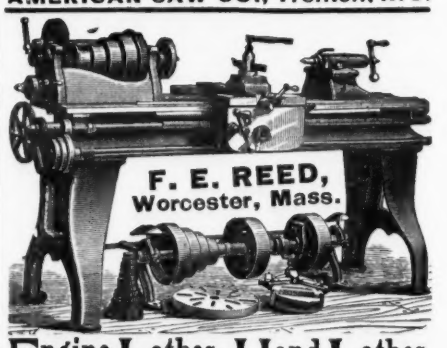

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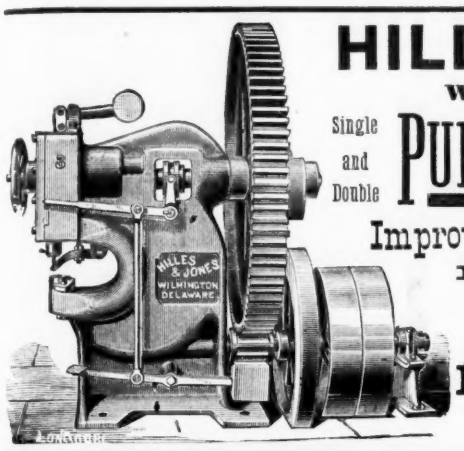

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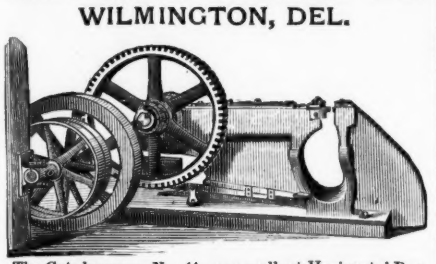

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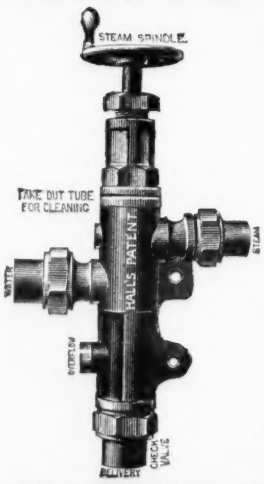

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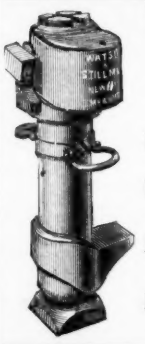

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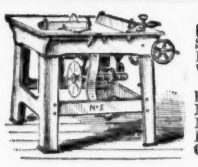

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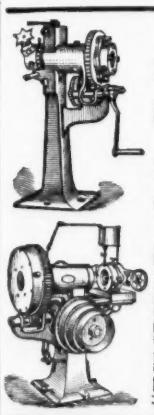

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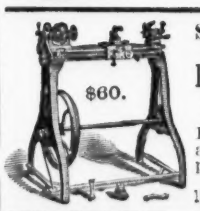

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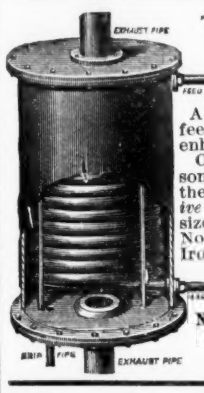

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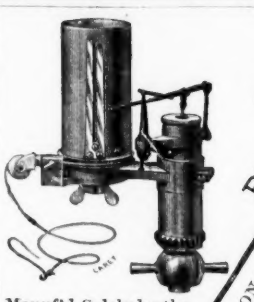

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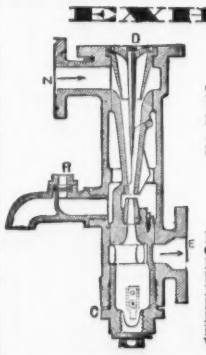

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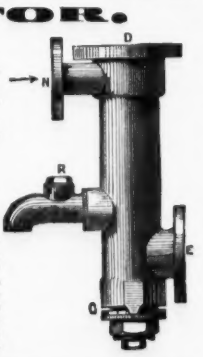

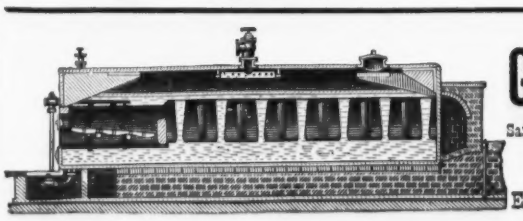

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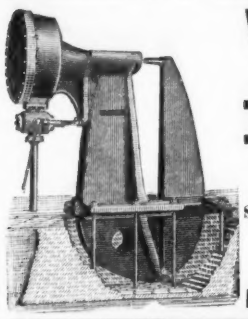

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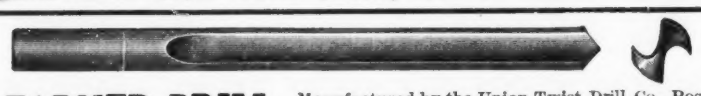

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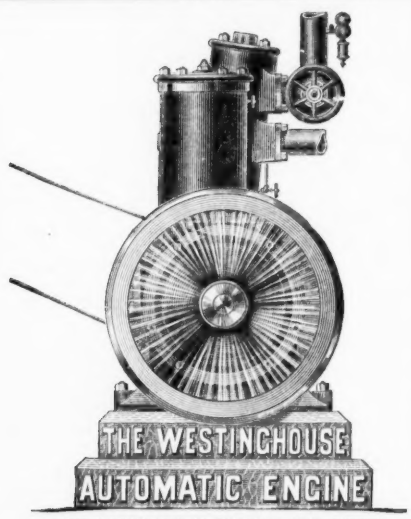

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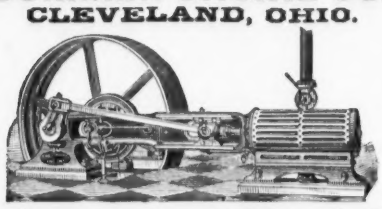

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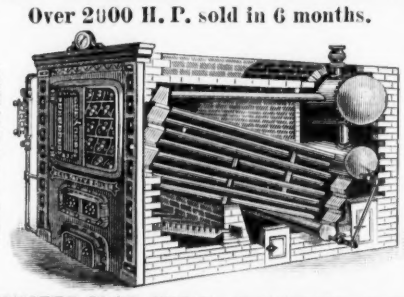

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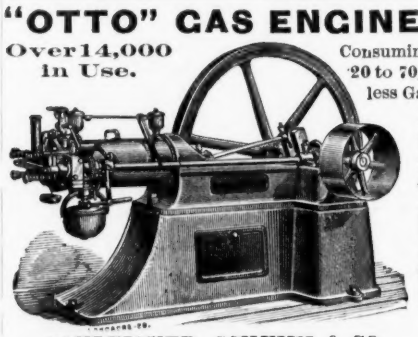

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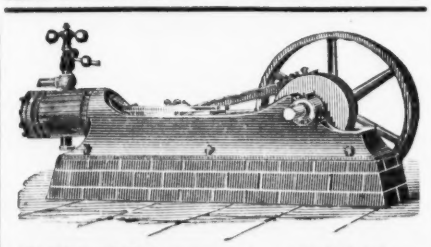

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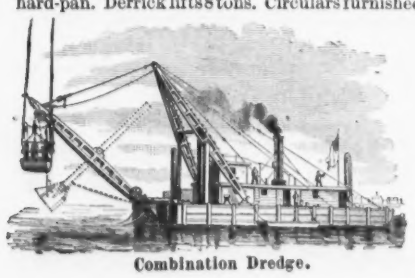

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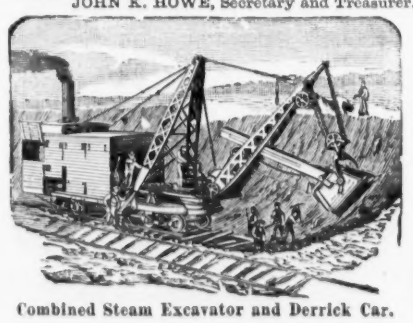

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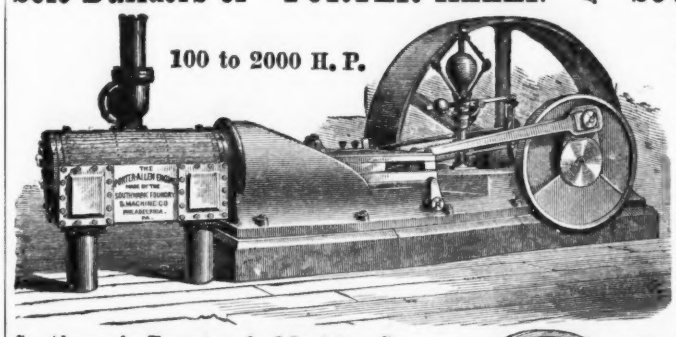

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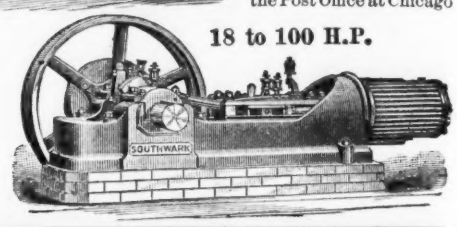

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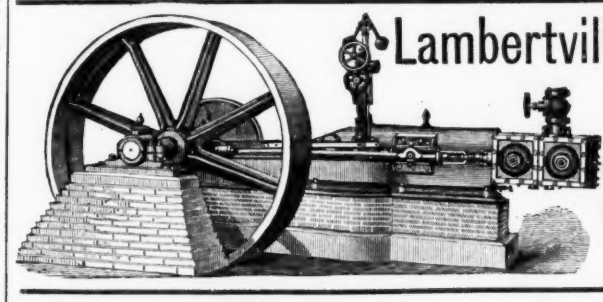

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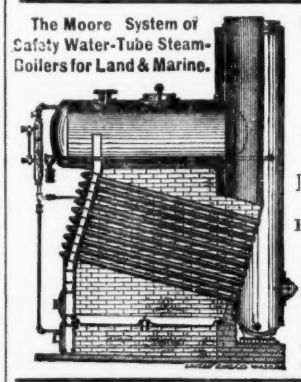

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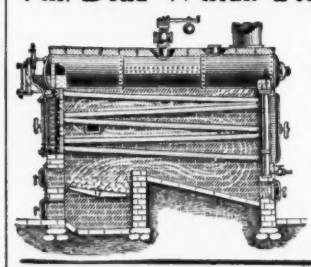

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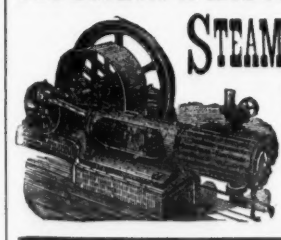

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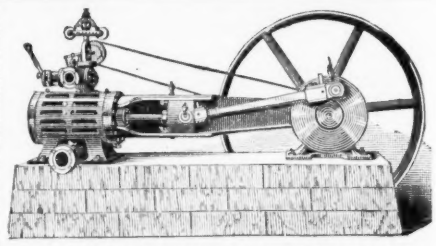

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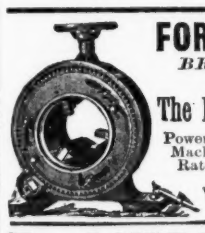

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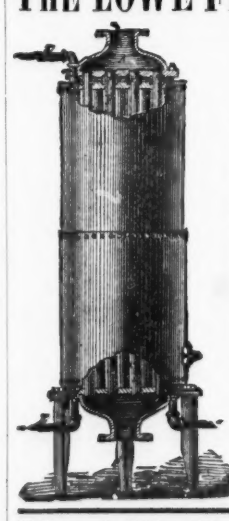

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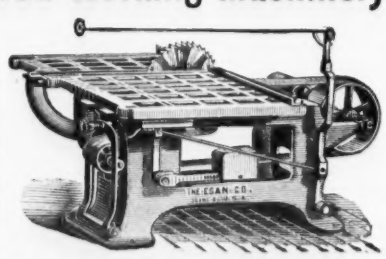

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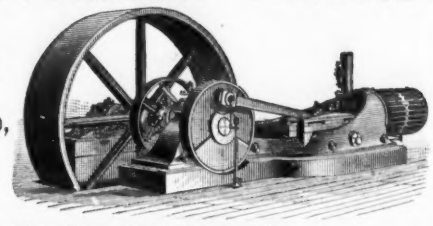

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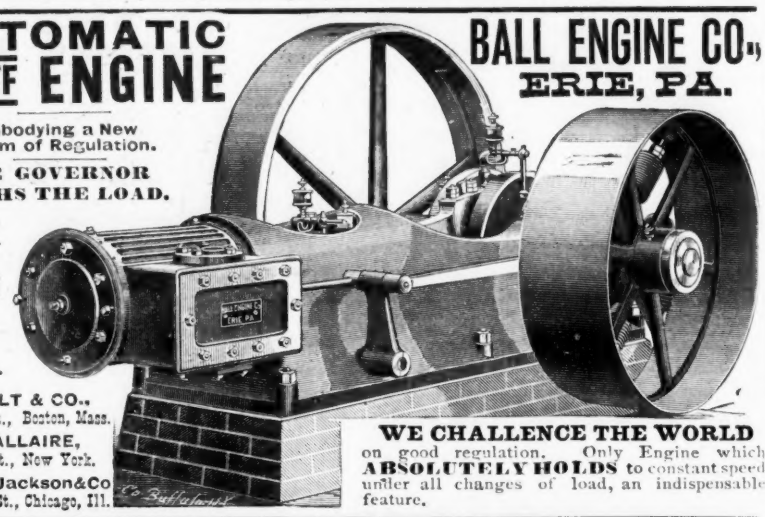

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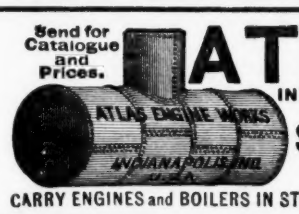

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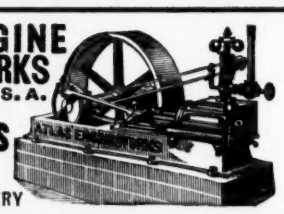

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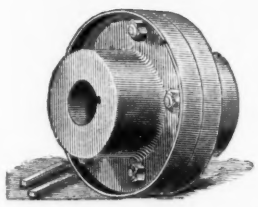

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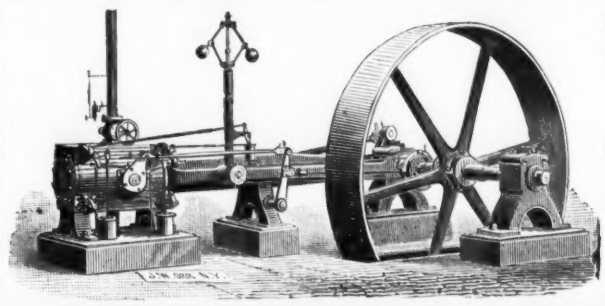

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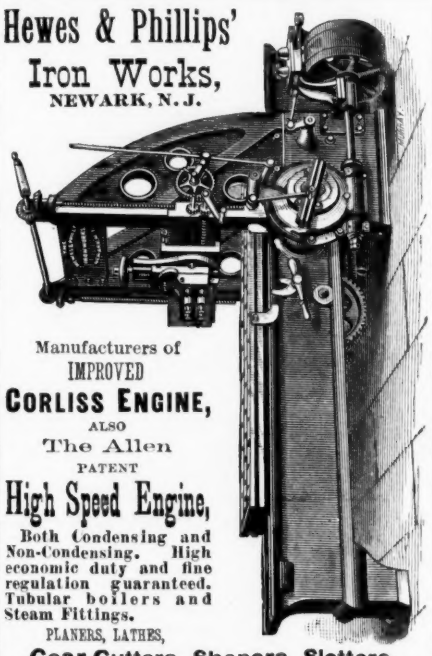

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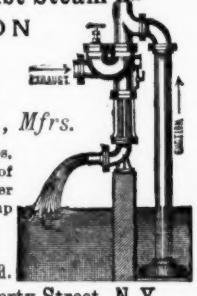

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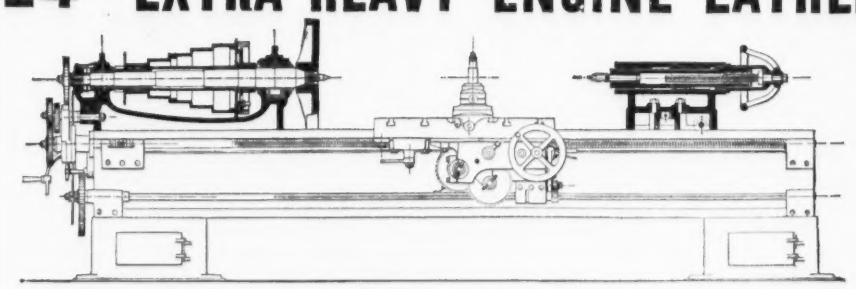

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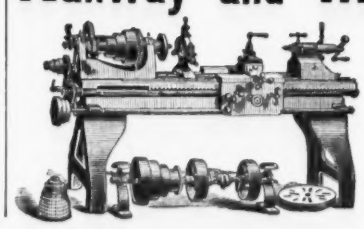

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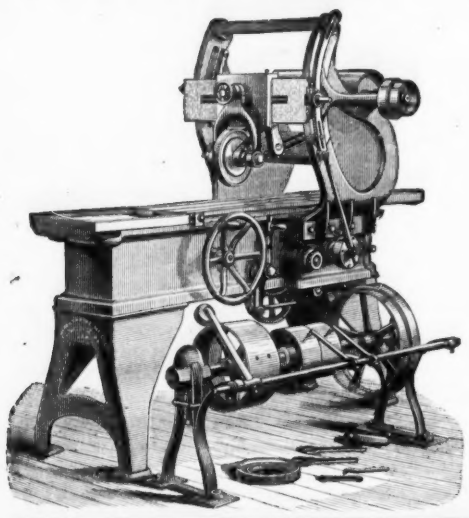

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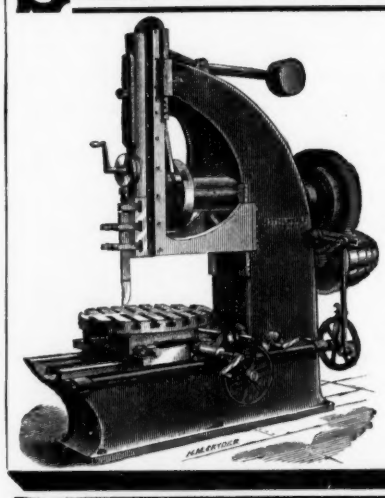

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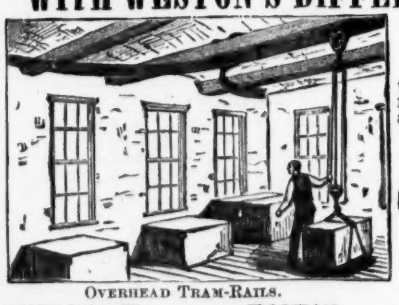

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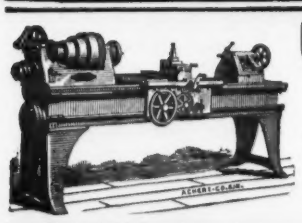

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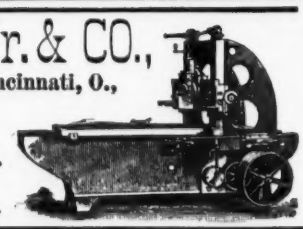

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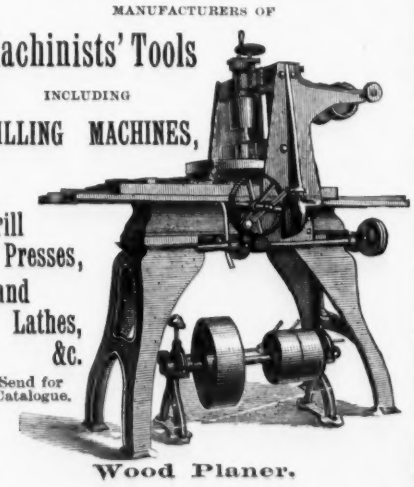

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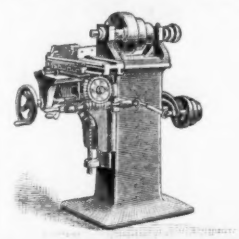

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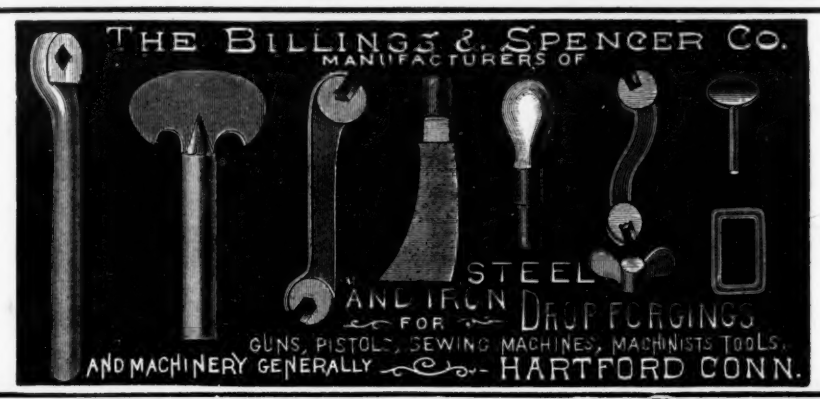

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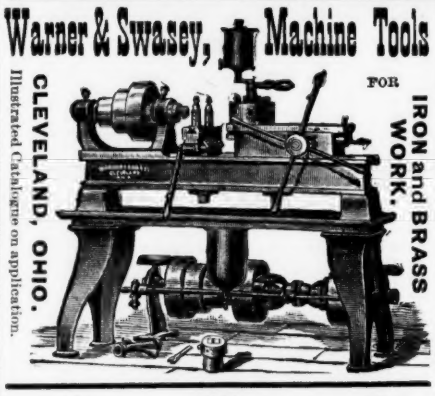

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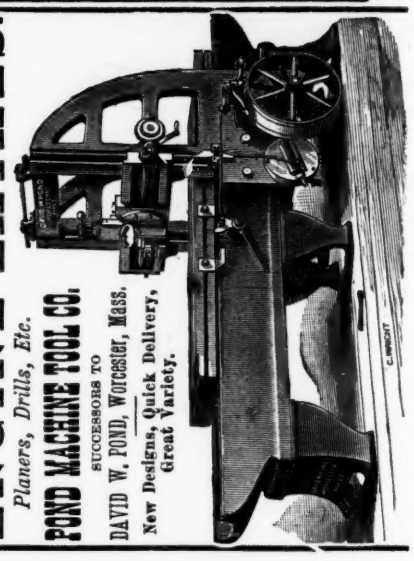

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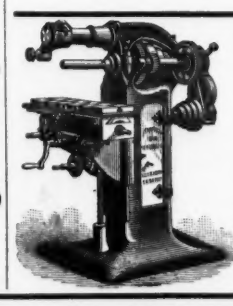

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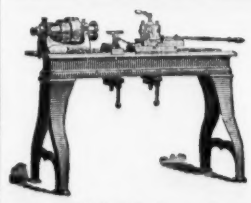

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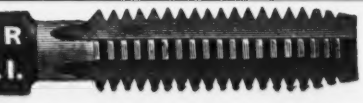

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